ARCHIVES of OPHTHALMOLOGY

VOLUME 8 (old series Volume 65) DECEMBER, 1932 NUMBER 6

TREPHINING

LT. COL. R. H. ELLIOT, Sc.D., M.D., F.R.C.S.
LONDON, ENGLAND

Dr. Arnold Knapp invited my opinion on some points in connection with my operation for glaucoma and especially on certain matters which have recently been dealt with by able American surgeons for whose opinion I have the greatest respect, however widely they differ from me. I naturally felt some diffidence in accepting his invitation, the more so as the operation that I perform today is almost identical with that which I had the pleasure and the honor of demonstrating so widely in America twenty years ago.

In giving my opinion on some features in the trephining operation and in particular on certain changes in the technic of this operation which have recently been suggested by American surgeons, I should like to say at the outset that the years which have passed by since my first publication have only served to strengthen my belief in the principles on which the operation was founded. I stated these in my first edition of "Sclero-Corneal Trephining," [1] in 1913, and repeated the advice I gave in every one of the five books that I wrote on the subject up to the second edition of my "Treatise on Glaucoma," [2] in which I thus summarized it:

> The motive is to reach, tap, and drain sub-conjunctivally the anterior chamber with a minimum of injury to the structure of the eyeball. To this end the junction of the cornea and sclera is trephined as far forward as possible, the ciliary body is avoided, the chamber is entered directly by the trephine, and the iris is only dealt with in order to obviate any tendency it might otherwise have to block the trephine hole, and so to interfere with filtration. The cardinal rules are few and short, namely, (1) dissect the conjunctivo-corneal flap forwards, a full millimetre if possible, splitting the cornea for the purpose; (2) utilize every fraction of a millimetre of the space so gained and apply the trephine as far forward as possible, consistent with the avoidance of injury to the flap, and (3) use a sharp trephine.

From the very commencement there were those who opposed me in this attitude which I had taken up, and who advocated trephining through the sclera over the ciliary body. One such was Dr. Freeland Fergus, who went further, for he used a large trephine (3 mm. in diameter) and combined a cyclodialysis with his trephining. From time to time, there have been those who have advocated procedures similar to this. With every deference to them, I hold that they are making

1. Elliot, R. H.: Sclero-Corneal Trephining in Operative Treatment of Glaucoma, London, G. Pulman & Sons, 1913.

2. Elliot, R. H.: Treatise on Glaucoma, ed. 2, London, H. Frowde, 1922.

a retrograde step, and I would once again urge that whatever operation they adopt, they should keep before them the principles embodied in the foregoing statement. I lay the more emphasis on this because, quite recently, able surgeons have suggested that the point of entry of the trephine should be on the scleral side and a hinge left on the corneal side. With every respect for their opinion I would submit that they are going back on the principles which should govern the procedure. *The farther forward one can place one's opening, the safer one is to get an iris-free entry into the chamber.*

It would be difficult for me to defend my thesis within the limits of such a paper as this, but I would ask those who are sufficiently interested in the subject to read part VIII of chapter IX of my book already referred to,[2] pages 531 to 559, to which I have practically nothing to add. I would especially invite attention to diagrams 173 to 176, which show how the trephine hole may be interfered with by iris tissue which has become adherent to the back of the cornea and drawn forward so as to block the route of entry into the anterior chamber. I believe that this adhesion of uveal tissue to the cornea is the most fruitful source of failure after trephining in cases of long-standing subacute glaucoma. I shall come back to this subject again presently, but I should like to lay the greatest possible emphasis on what I hold to be the most important rule for success after trephining: "Avoid all unnecessary interference with the iris." A clean entry into the anterior chamber spells success; an oblique or partial entry is replete with the danger of failure.

This leads me to my next point. I still regard an iridectomy as merely a safety valve or sluice-gate, which allows the aqueous fluid to escape through the trephine hole without the danger of carrying the underlying portion of the iris with it. A small peripheral iridectomy does everything that is demanded and saves the patient from the inconveniences of a complete coloboma. The dazzling which results from the last-named condition is most disconcerting to many patients, especially in the sunlight, and is often bitterly complained of. As to the method of performing the iridectomy, I have nothing to add to what I wrote on pages 548 to 551 of my last book, but I would emphasize certain very important points. 1. Seize the disk and the projecting iris with one grip of the forceps and cut off the two with a single snip of the scissors. 2. If one fails to do an iridectomy this way, it is usually far safer to leave the iris alone than to go after it in the depths of the trephine hole, especially if it has fallen well back into the chamber and if aqueous has escaped freely. If, on the other hand, it is showing a tendency to bulge, a small opening can often safely be made by seizing it with the forceps illustrated on page 546 of my book, and snipping it off with the scissor points directed into the hole. If the iris is left intact, one is confronted with the possible danger of having to turn

down the flap at a subsequent date in order to make a hole in the membrane. Fortunately, this necessity rarely arises, and from the point of view of a perfect result, nothing compares with that in which filtration follows an operation which has left the uveal membrane intact. There is one piece of advice which I can give to every operator with the most absolute confidence: *Never drag on the iris.* To do so causes its impaction in the trephine hole. It is easy to get it impacted, and difficult to get it disentangled again. I look on all manipulation through the trephine hole as difficult, dangerous and to be avoided if possible. I know that many surgeons of high repute in America will disagree with me, and will contend that the impaction of the iris in a wound helps to secure filtration. I cannot speak with any experience of deliberate impaction of the iris in keratome and other such wounds, as I have always scrupulously avoided it, but if there is one thing that I am absolutely confident of, it is that the impaction of uveal tissue in a trephine hole is nothing short of a disaster. The clearer one can keep the filtering channel of it, the better will be the results.

I am asked how to overcome the difficulty met with in those cases in which the iris does not present at the conclusion of a trephining. This complication occurs most often when, for any reason, the fluid escapes early, and so there is no *vis a tergo* to drive the iris into the trephine hole. One of the reasons for it may be that the surgeon lifts his trephine when he has only just entered the chamber over a very small area, instead of going on until he has cut completely through about two thirds of the disk. This may be due to nervousness and to a fear of going too far. Able surgeons have told me that this handicaps them in trephining. I would, therefore, venture to offer some advice on the subject: 1. The danger of going too deep is very, very much less than that of stopping too early. If you do go too deep, the patient will tell you of it, for the iris is sensitive, and he will feel the pressure of the trephine on it, but so long as the anterior chamber remains full and the surgeon's fingers are sensitive, the danger of doing any harm is small indeed. 2. Watch the side of the trephine for the escape of fluid, and go on long enough to make sure that you are well through. A free escape is, I think, a certain index that the trephine has done its work. 3. Get your assistant to watch the pupil carefully for the upward movement which always accompanies the escape of aqueous from the chamber. This is a delicate test, and as his experience increases, he will be of great value to you in your decision as to whether you have done enough. 4. There is a curious sucking feeling when the trephine cuts well through. This can often, though not always, be felt, and is a sure indication, not only that you have entered the chamber, but that the iris bead will come out as you withdraw your trephine. 5. Always use a very sharp trephine. A blunt instrument asks for trouble.

If the fluid escapes too early, and sometimes if it escapes too freely, the surgeon is confronted with great difficulty in dealing with the iris. It is chiefly in soft eyes that this occurs. An eye which may be hard in the consulting room may have softened considerably before the patient reaches the table, especially if miotics have been used. Again, in chronic glaucoma, one has to trephine eyes which, for a large part of their existence, show a normal or subnormal tension. In all such, the risk that the iris will not present has to be faced. It can be greatly lessened (1) by very careful trephining, with the avoidance of lifting of the trephine until it is certainly well through the cornea; and (2) by *insuring strong miosis just before the operation.* To this end I always have a solution of physostigmine, 4 grains (0.259 Gm.) to the ounce, instilled an hour before the operation, and again just before commencing the preparation of the eye. The necessary preliminary use of cocaine, novocain, etc., may otherwise lead to a mydriasis, which is most disconcerting, for the free edge of the dilated pupil will then lie in the neighborhood of the trephine hole, and may find its way into it and so allow of an excessive escape of aqueous, even though the iris may have presented in the first instance. I have not found pilocarpine nearly so satisfactory as physostigmine for this purpose.

There is one last point of interest in this connection. When the surgeon starts shaping his flap, the eye may feel hard; indeed, it is curious how hard a glaucomatous eye may feel to the touch of the forceps and scissors. By the time that the limbus has been reached, he is often conscious of a distinct fall in the intra-ocular pressure. I think that every surgeon of experience must have noticed this. When it occurs, it is most unmistakable. Is it due to the escape of fluid from within the eye through the perforating vessels being cut close to the sclera as the flap is being shaped? I think that it is, but I have often wondered whether there is another element—a reflex vasomotor action—as well. Whatever the explanation may be, the facts are beyond dispute, and if the fall in pressure has been marked, an emptying of the chamber without presentation of an iris button is to be feared, especially if the pupil is not well contracted. In such a case, be careful to avoid lifting the trephine until you are certain that the chamber has been well entered.

There is another suggestion which has been recently made, namely, that it is not necessary to remove a piece of iris and that merely a slit in the membrane suffices. I think that this may be quite sound, but I am not absolutely confident about it. I know well that my own preference is for a small, clean, peripheral aperture, just below the trephine hole. It may be that a slit will provide this, but I am not quite sure of it, and when it is so easy in most cases to take out a piece of iris, I prefer to do so. There is, however, a much more important point

involved. I regard the *removal of a definite area of Descemet's membrane as essential to the success of the operation.* I think that to leave this membrane behind, even when all the layers above it are taken away, is to court disaster. I have dealt with this at length in chapter X, part 2, of my "Treatise on Glaucoma," under "The Histology of the Trephine Disc." Now, if a bead of iris pushes up the hinged disk and bulges through the opening, it is obvious that when the surgeon seizes the two structures (the iris and the disk) in his forceps, he must necessarily cut out a large area of Descemet's membrane. In so doing he effects what Treacher Collins has maintained is one of the essential requisites for a safe filtration scar. It may be said that if the disk is well and cleanly cut, the whole thickness will come out when its free edge is pulled on. I freely admit that this is usually the case, but I would add the comment "not always." I am happiest when, at the close of an operation, I have seized disk and iris in one grip and made a small peripheral iridectomy with a single snip of the scissors. I admit that at times the iridectomy is complete instead of peripheral. This, however, is uncommon, and even when such an event occurs, the very narrow iridectomy seldom leads to any inconvenience.

I am asked what instrument I now use to split the cornea. I went back, many years ago, to the closed points of the scissors with which I had shaped the flap in my earliest operations, and I prefer them to anything else. The point I would emphasize is that for a successful trephining it is necessary to *split the cornea* along its layers and not to cut across those layers. Anatomically it has been shown that the cornea can be thus split, and I believe that permanency of filtration is more certainly secured when the layers of the cornea are separated from each other instead of being cut across. It is when one fails to split the cornea readily, and therefore has to have recourse to cutting action, that one is most liable to meet with failure. I admit that this is open to the fallacy that the latter class of cases is the more dangerous and difficult, for this complication is met with most often, if not exclusively, in cases in which there has been long-standing congestion, which has matted the layers of the cornea together. Notwithstanding this, I hold to my belief that it is safer to split the cornea with a wedge-shaped instrument than to use a sharp blade and cut across its layers. When I first introduced sclerocorneal trephining in London I was told that it was an anatomic impossiblity to split a cornea. That fallacy is, I think, long since dead. Even without anatomic evidence the smooth crescentic surface obtained showed from the first what the actual nature of the procedure was.

With regard to mechanical trephines, I have never been in favor of them. I do not think that anything can replace the educated touch of a skilful surgeon. Moreover, the difficulty of insuring absolute steril-

ization has always put me against them. I have read with great interest the description of "A new Automatic Trephine," by the Drs. Green [3] of San Francisco. There are, however, two statements in their article that I would venture with all deference to challenge, namely, that (1) "with the ordinary trephine considerable pressure must accompany the rotary movement produced by the fingers," and that (2) "this manipulation also produces wobbling of the globe and a consequent increase in the amount of trauma."

If considerable pressure is being applied, I consider that the trephine is not being properly used. It should be made to cut its way through by quick, light, rotating movements, and almost by its own weight. This permits great control of the instrument and enables the operator to feel, in a large percentage of cases, the sucking movement as the blade enters the chamber—a very important point. Nor do I agree that the hand trephine involves an increased amount of trauma; indeed, it has always seemed to me to be the opposite, and I have watched with alarm the spin and the buzz accompanying the use of a mechanical instrument. I have also seen considerable harm done by the flap becoming involved in the rapidly rotating instrument. I am very far from wishing to decry the Green instrument, and am hoping to give the latest model a trial in the near future. I can see that it has possibilities for one who does not do a large amount of trephining, and for this reason it interests me very much on behalf of beginners who write to me of their difficulties in using the hand trephine. It certainly appears to be a great advance on any previous model with which I am acquainted. Von Hippel's trephine was an abomination, and there were, to my mind, distinct objections to Vogt's motor instrument. If the Green automatic trephine could be kept in absolute alcohol for a few minutes before use, and then laid out to dry, one would feel confident that it would not spray dust into the wound. Is such a method of sterilization possible?

I am asked why I have not given a trial to Dr. Wilmer's method of using a graft of Tenon's capsule over the trephine hole. Any suggestion coming from Dr. Wilmer would always command my respect and attention, but I have hesitated to adopt this one for several reasons: 1. My great desire is to get the operation finished as cleanly and quickly as possible, and I look with a certain amount of dread on any procedure which lengthens the operation after the trephine hole has been made. The danger of escape of the vitreous always looms dark in the background. The sooner I can get the wound closed, the happier I am. 2. I am convinced that one of the great dangers of failure of trephining lies in a want of absolute asepsis of the wound. This being so, I should look with some anxiety—perhaps quite uncalled for—on the

3. Green, A. S.; Green, L. D., and Green, M. I.: A New Automatic Trephine, Arch. Ophth. **6**:752 (Nov.) 1931.

use of such a graft. My feeling would be that it might add in some small measure to the danger of upsetting this desired asepsis. On the other hand, if the ordinary operation is proceeded with from start to finish, the margin for possible sepsis is almost nil. 3. In the very class of cases in which such a graft would be most required, i. e., in those of old people with very thin conjunctivae and with scanty subconjunctival tissue, it would, I think, be most difficult to obtain and to apply. The closing stages of the operation in these cases always occasion anxiety, and speaking personally, my own great desire is to finish the operation with a minimum of manipulation. 4. My strongest reason for not having tried the graft is that I have so rarely met with vesicular scars, either in my own practice or in that of others. Moreover, when I have met with them, they have usually either given little trouble or been amenable to treatment. I am far from wishing to argue against Dr. Wilmer's thoughtful suggestion, and I should not have put these views forward except in reply to a direct question. Few things strike the experienced surgeon more than the great differences in technic which characterize the work of men, all of whom are getting excellent results. It will be interesting to hear Dr. Wilmer's later experience with this new procedure, now that he has had time to watch its after-results.

LENTICONUS POSTERIOR

FURTHER STUDY

ELIAS J. MARSH, M.D.
PATERSON, N. J.

About five years ago, a report of a typical posterior lenticonus which I had studied with the slit-lamp was published in the ARCHIVES OF OPHTHALMOLOGY,[1] with an analysis of four similar reports, one by Vogt, two by Riedl and one by Whiting, all that had appeared at that time.[2] Since then, through the courtesy of Drs. H. H. Tyson and J. Ziporkes, of New York, I have been able to observe two other cases with the slit-lamp, and over twenty slit-lamp studies have been reported under this title. Moreover, in this interval the knowledge of the normal and abnormal lens and neighboring structures has been advanced by many slit-lamp workers and others, so that the time seems opportune for a review of the whole subject of lenticonus posterior.

The number of cases published in the past six years—about half as many as in the previous thirty-five—has raised the question whether this anomaly is as rare as had been supposed. Butler [3] supported his contention that it is not by citing six cases of his own and referring to a number of unreported cases that he had heard of. He added that probably many remain unreported, as not all ophthalmologists have the knowledge necessary to recognize a posterior lenticonus. But this argument works both ways, for it is evident from the reports that some of those reporting are unable to answer the old conundrum in the form: "When is a lenticonus not a lenticonus?" After the slit-lamp unmasked the so-called false lenticonus, it was expected that further mistakes in diagnosis would not occur, but this expectation seems to have been too optimistic, for some of the reported slit-lamp diagnoses are not much further above suspicion than some of their predecessors.

Any exact diagnosis must be based on a satisfactory definition—something that I have not found for this condition. Collins and Mayou [4]

Read in abstract before the Eye, Ear and Throat Section, Medical Society of New Jersey, Atlantic City, N. J., June 17, 1932.

1. Marsh, E. J.: Slitlamp Study of Lenticonus Posterior, Arch. Ophth. **56:** 128 (March) 1927.

2. The report of a second case by Vogt, cited later, appeared while my paper was in preparation.

3. Butler, T. H.: Lenticonus Posterior; Report of Six Cases, Arch. Ophth. **3:**425 (April) 1930.

4. Collins and Mayou: Pathology and Bacteriology of the Eye, ed. 2, Philadelphia, P. Blakiston's Son & Company, 1925, p. 45.

described posterior lenticonus as a protrusion backward of the lens substance through a gap in the capsule into the vitreous, or, if the capsule is only abnormally thin and not actually deficient, a bulging backward of the lens substance at the posterior pole. This definition certainly begs some major questions, beside being indefinite in important respects. The most exacting definition which I have found is that of Colombo,[5] who, writing without the aid of the slit-lamp, also urged the necessity for exact standards. He said to distinguish posterior lenticonus from other lesions with changes at the pole, "one should require in a veritable lenticonus the following characteristics: a congenital lesion, without anterior lens changes connected with the conus, and absence of any tissue changes pointing to disease or trauma . . . a transparent, hemispherical, sharply outlined prominence on the posterior pole." This specification is almost too rigid, as it would exclude many otherwise undoubted cases on account of incidental, or perhaps secondary, complications. Besides, it, too, begs some questions, which I shall consider later. But it is useful as a standard, describing as it does the type of normal lenticonus, or lentiglobus, by which others are to be judged. By common consent, all recent clinical observers deny any right to the term to those cases of deformed lenses in buphthalmic eyes reported by Pergens [6] and Gourfein-Welt,[7] as well as to the naturally or experimentally deformed animal lenses reported by Mulder,[8] von Hess,[9] Denig,[10] and others. Moreover, the former classification of "false lenticonus" is now rendered obsolete and is no longer entitled to consideration (Vogt).

Comparison of the reported cases shows that for the best results of study, some classification of them is necessary, though more difficult than definition. Finding no other system offered, I have grouped them as follows:

Class 1: Colombo's type form, a transparent, hemispherical bulge set "like a skull-cap" on the posterior pole of an otherwise normal lens. Approaching this standard closely enough to qualify are Vogt's second

5. Colombo, G. L.: Lenticone postérieur; calcul du rayon de sa courbure: Hypothèse embryologique sur le mechanisme de sa formation, Ann. d'ocul. **161**:364, 1924.

6. Pergens, E.: Buphthalmus mit Lenticonus posterior, Arch. f. Augenh. **35**:1, 1897.

7. Gourfein-Welt, L.: Le lenticone postérieur chez l'homme; son diagnostic et sa pathogénie, Arch. d'opht. **31**:625, 1911.

8. Mulder, M. E.: Ein Fall von Lenticonus posterior, anatomisch untersucht, Klin. Monatsbl. f. Augenh. **35**:409, 1897.

9. von Hess, Carl: Ueber foetale Rupturen der hinteren Linsenkapsel und ueber Lenticonus posterior, Ztschr. f. Augenh. **2**:427, 1899.

10. Denig, R.: Histology and Etiology of Posterior Lenticonus, Ophth. Rec. **8**:168, 1899.

case,[11] Riedl's first case,[12] von Pellathy's case,[13] Lloyd's first case [14] and mine.[1] The descriptions available of some are a little unsatisfactory, but apparently all show the ring reflex of Vogt, as described in my former paper and several others beside Vogt's own; all have a sharply defined circular margin, approximately hemispherical in form, clear contents and a transparent bottom, through which the retinal vessels may be seen, although there is, in most, some roughening or stippling or partial opacity of the inner surface of the capsule; all have otherwise normal lenses. Of special interest in Vogt's case and mine is the "scissors reflex," [15] not observed by any other reporter but Ziporkes.

Class 2: Grouped in a somewhat arbitrary order, those cases otherwise typical, but showing opacity at the bottom of the conus or irregularity in its form. In this class, if I understand the descriptions correctly, are Ziporkes' case,[16] lacking only transparency of the capsule to be a perfect first instance, Vogt's first [17] and third [18] cases, Riedl's second,[12] Butler's first and second [3] and Wilczek's case.[19] These cases differ somewhat among themselves, but all show undoubted conus; in several there were rays or layers of greater or less opacity reaching out into the senile nuclear layer of the lens; in some the conus contents were clear, in others hazy. Butler presented interesting cuts, which showed several posterior lines of discontinuity bulging to follow the curve of the conus; they also showed a faint layer of opacity immediately in front of the conus and following the posterior curve, connected by a horizontal opacity with a similar layer on the surface of the embryonal nucleus, the whole figure being compared by Butler to a collar stud. This appearance makes a connecting link with my third group.

---

11. Vogt, Alfred: Lehrbuch und Atlas der Spaltlampenmikroskopie des lebenden Auges, Berlin, Julius Springer, 1931, vol. 2, p. 452.

12. Riedl, A.: Lenticonus anterior; Lenticonus posterior, Klin. Monatsbl. f. Augenh. **71**:344, 1923.

13. von Pellathy, A.: Ein Fall von Lenticonus posterior, Klin. Monatsbl. f. Augenh. **78**:60, 1927.

14. Lloyd, Ralph I.: Posterior Lenticonus, Am. J. Ophth. **13**:971, 1930.

15. "Die, soweit ich sehe, bis jetzt von keinem Autor erwähnten Scherenreflex." (The scissors reflex which, so far as I know, has not been mentioned by any author.) (Vogt, [footnote 11, p. 453]). In a footnote on page 450, he refers to my former paper in a way that shows acquaintance with its contents, but he does not seem to have read the description, on page 134, of a reflected light-band "opening with a scissors motion pivoted in the center." Vogt's first description was published in Klinische Monatsblätter für Augenheilkunde in 1926 (**77**:709 [Nov.] 1926), mine [1] in March, 1927, and Vogt's second report [11] in 1931.

16. Ziporkes, J.: Posterior Lentiglobus, case presented before the New York Academy of Medicine, Dec. 21, 1931 (not published).

17. Vogt: Arch. f. Ophth. **108**:187, 1922; footnote 11, p. 450.

18. Vogt (footnote 11, p. 453).

19. Wilczek, M.: Posterior Lenticonus, Klinika Oczna, June, 1931, p. 1: abstr., Am. J. Ophth. **15**:184 (Feb.) 1932.

Class 3: Those cases with a good lenticonus, but with related opacities or other changes in the lens substance. In this group are Reese's two cases [20] and Tyson's,[21] all bearing an interesting relation to those of Butler just described. Tyson's case showed a class 1 lenticonus, though rather shallow, but was complicated by a dense white axial opacity, shaped like a trumpet, and placed between the embryonal nucleus and the normal site of the posterior surface, but not reaching the surface of the conus. Reese's two cases showed a typical lenticonus contour, but in the region occupied by Tyson's "trumpet" and Butler's "collar stud," the slit-lamp showed, in both cases, an optically empty broad conical crack between the embryonal nucleus and the adult nucleus, apex backward; from this there extended back to the base of the conus a group of small dark optically empty spaces, the whole resembling a volcano and spreading cloud of smoke. Each of these writers illustrated his paper with excellent drawings, and on comparing them, one is struck by the similarity in outline and position of the figures, suggesting the thought that they may be three different stages of the same process, beginning with the "volcano," or incipient stage, and passing through the faint opacity of the "collar stud" to the dense opacity of the "trumpet." I shall return to this later. I have also included in this group Butler's third case, though the opacities differed from those just described.

Class 4: A number of cases in which the description is so vague or the complications are so anomalous as to render classification uncertain, or even to make it doubtful if some are true cases of lentiglobus at all. They include Vogt's fourth [18] case, Butler's fourth, Bothman's,[22] von Szily's [23] and Samojloff's.[24] Bothman described cataractous changes of the posterior surface which obscured the actual outlines of this surface, and the ring reflex of Vogt, usually considered a diagnostic slit-lamp sign, was wanting; he ascribed this to the cataractous changes. In his case the conus began at the embryonal nucleus, with changes in this nucleus itself, and brown punctate opacities, beginning just behind it, went back as far as could be seen with the slit-lamp. The involvement of the embryonal nucleus he regarded as evidence that the changes began much earlier than is usually supposed—an interesting assumption if correct, but one not necessarily valid, as will be seen. Butler's fourth case also showed a cataract which obscured the outline of the posterior surface, leaving the actual presence of a conus or globus uncertain; it

20. Reese, W. S.: Posterior Lenticonus, Tr. Am. Ophth. Soc. **26**:339, 1928.

21. Tyson, H. H.: Lenticonus Posterior, Arch. Ophth. **57**:38 (Jan.) 1928.

22. Bothman, Louis: Posterior Lenticonus, Am. J. Ophth. **14**:820 (Aug.) 1931.

23. von Szily, A.: Zur Klinik und Pathogenese des sogenannten Lentikonus posterior, Klin. Monatsbl. f. Augenh. **77**:845, 1926.

24. Samojloff, A. J.: Posterior Lenticonus, Russk. j. opth., December, 1928, p. 731; abstr., Am. J. Ophth. **12**:348, 1929.

showed a curving backward of the internal surfaces of discontinuity, which might be accepted as evidence of the existence of a conus, were it not for the description of his last two cases, in the fellow eye and the eye of the patient's son, respectively.

Finally I have collected a small group of cases which are certainly not "veritable lenticonus" in any sense that Colombo's definition could be stretched to cover, but which might be confused with it, or are of interest for comparison. These I have called quasi-lenticonus. They include Butler's fifth and sixth cases, which resembled his fourth, but "the posterior basin-like depression did not appear to reach the posterior capsule. The contour line of the capsule could not be seen behind the opacity, but as far as one could judge, it was normal." For this condition he suggested the name, lenticonus internus. Of interest for comparison with this is a case of Volmer's [25] with congenital cataract in the posterior layers and a normal surface curve; but the adult nuclear layer bulged backward to the cataract, thus forming a "conus internus" of its own. A case reported by Nordmann [26] should probably be included here, but the original report of this has not been available to me. Vogt's "cataract near the posterior surface, with rudimentary and atypical posterior lenticonus,"[27] may also be included; also a case of fetal iridocyclitis studied microscopically by Leech [28] with actual rupture of the posterior capsule and escape of the lens contents, to which the hyaloid artery was attached.

Several writers have emphasized the distinction between lenticonus and lentiglobus, and in my former paper I expressed the opinion that they might represent two different anomalies at the same site. I still think that there may be two, or more, different anomalies, but no longer regard the distinction based on mathematical form as significant. There may be some advantage, however, in reserving the term lentiglobus for the "veritable" cases, while using lenticonus as a generic name for any abnormal backward protrusion of or on the lens surface. The best formed examples are fairly exact segments of spheres, but not all are complete hemispheres. Of the three which I have examined, my own appeared to be a perfect hemisphere, but Ziporkes', though fairly circular in outline, was somewhat less than a hemisphere, and Tyson's even shallower. Vogt's second case, on the other hand, was said to show a depth slightly greater than the cross-section. However all of these made fairly perfect domes.

---

25. Volmer, W.: Angeborene Katarakt im Bereiche einer atypischen Ansatzstelle der Hyaloidea, Arch. f. Augenh. **97**:31, 1925.

26. Nordmann, J.: Posterior Cataract in Form of a Saucer, Bull. Soc. d'opht. de Paris, July, 1927, p. 328; cited, Am. J. Ophth. **10**:882 (Nov.) 1927.

27. Vogt (footnote 11, p. 418).

28. Leech, V. M.: Persistent Posterior Fibrovascular Sheath of the Lens, Caused by Fetal Iritis, Arch. Ophth. **4**:332 (Sept.) 1930.

In every report which mentioned the nucleus or the anterior and posterior Y's, these were stated to be normal in position. Formerly, dislocation backward of the nucleus was regarded as characteristic of the condition, and was quoted as favoring the hernial theory of its origin. The ages of the patients varied from 6 to 67 years, but this means merely the age at discovery; more important is the lack of any relation between age and type, the oldest patient as well as some of the youngest belonging in class 1 and the other classes also showing a scattering in ages. Every affected eye of which the peripheral refraction (outside the conus area) was given, except two, is hyperopic; in one case in which the refraction was not given, the fellow eye was hyperopic 5 diopters. Several observers have noted the remains of hyaloid vessels near the nasal edge of the globus margin. Butler described an eye with the hyaloid vessel remains attached directly to the apex of the globus. In no case was a complete, or even a considerable, persistent hyaloid vessel recorded. Most vessels were described as being at the pole, but a few were ectopic, usually low, Ziporkes' being rather above the horizontal. Observations on the relation to the arc line were practically confined to Vogt, and will be considered hereafter.

ANATOMY AND EMBRYOLOGY

Before examining the nature of this anomaly and the various explanations of its origin that have been proposed, it might be worth while to review briefly the anatomy and embryology of the parts involved. For the ensuing description I am indebted chiefly to Mann,[29] though Salzmann, Druault, Vogt and others have also been drawn on.

The lens, it will be remembered, is developed from the embryonal lens vesicle, which is itself formed by infolding of the primitive lens plate of the surface ectoderm. The cuboidal cells of the anterior half of the lens vesicle remain practically unchanged, and form the anterior epithelial layer of the lens. The posterior cells, on the other hand, elongate, pushing their heads forward till they eventually fill up the cavity of the vesicle, becoming the primitive lens fibers and forming the primary embryonal nucleus, occupying the central dark interval seen with the slit-lamp. The outer ends of these cells take on a conical form, giving off fine fibrils that connect with the primary vitreous, in whose formation they take part. Shortly after this, the lens capsule begins to form. Further growth of the lens is by formation of new fibers at the equator, which push their ends forward between the heads of the primary central fibers and the epithelium, or backward between the primary fibers

29. Mann, Ida C.: The Development of the Human Eye, London, The Macmillan Company, 1928.

and the hyaline posterior capsule. The central primary nucleus is thus encircled by new fibers which form the outer embryonal nucleus and whose ends, as they join anteriorly and posteriorly, form the Y sutures. This process continues throughout life. At birth, each Y lies almost beneath the capsule, but as new layers continue to be formed they come to lie more deeply, and as the fibers become longer and more numerous the suture figures become more complex. Hence it follows that defects situated outside the embryonal nucleus cannot be congenital, but postnatal defects may be developmental, for development continues throughout life; on the other hand, disturbance of the embryonal layers need not be congenital, but may be due to causes arising in later life.

The internal structure of the lens has been shown by Rabl and others to consist of both radial and concentric lamellae, as determined by the systematic arrangement of the fibers; it has been compared to both an onion and an orange.[30] Vogt accepts [31] the view of Koelliker and others that the lens fiber is in fact a minute flexible tube with fluid content which shifts back and forth under pressure, so producing the change of form in the individual fiber and in the lens as a whole necessary for accommodation. He rejects Gullstrand's theory that the fibers slide on one another like the leaves of a carriage-spring. On account of this tubular character, Druault [32] proposed the term "lental tubule," instead of lens fiber. The fibers, or tubules, are arranged in pairs, reaching from a posterior suture around the equator to a suture in front, meeting end to end in the suture lines, and being so arranged that the fibers of the same age and layer are of the same length. These suture systems, as also the surfaces of lamellar discontinuity, offer a *locus minoris resistentiae* to mechanical or chemical injury.[33]

Druault stated that in the region of the poles, between the capsule and the fibers, there is a collection of albuminous liquid called the subcapsular layer,[34] which also spreads between the branches of the suture stars, "the amorphous substance of the lens." He also called attention [35] to the manner in which the newly formed lens fibers, as they elongate from their origin in the equatorial whorl, push their ends with a gliding motion between the posterior capsule and the older fibers, thus producing considerable looseness between capsule and lens mass, which is important in the extraction of cataract after cystotomy.

30. Vogt (footnote 11, p. 319).

31. Vogt (footnote 11, p. 323).

32. Druault, A.: Appareil de la vision, in Poirier and Charpy: Traité de l'anatomie humaine, Paris, L. Bataille & Cie, 1904, vol. 5, p. 1127.

33. Vogt (footnote 11, pp. 353 and 398).

34. Salzmann, however, said that this is a postmortem phenomenon.

35. Druault, A.: Sur l'accroissement de la capsule du cristallin, Arch. f. vergleich. Ophth. **3**:279, 1912.

In a study of lenticonus, special consideration must be given to the lens capsule. This is a structureless membrane, the product of cell activity, and is not itself composed of cells or their processes.[36] It appears first at the posterior pole, in the intervals between the basal cones of the primitive lens fibers,[35] as a delicate cuticle, expanding laterally till it surrounds the lens. In the earliest stages it is, naturally, thickest in the polar area where it begins, but as it increases it soon reaches here its definitive thickness of from 2 to 2.5 microns, whereas in other parts it continues to grow till it reaches in some places a thickness of from 18 to 25 microns. The site of the area of minimum thickness of the capsule is so constantly at the posterior pole, according to Salzmann,[37] and so easy to demonstrate that it is valuable as a landmark in microscopic study. Its zone of maximal thickness lies a short distance within the line of attachment of the zonule and the capsulo-hyaloid ligament (ligamentum hyaloideo-capsulare of Wieger[37]). These two anatomic elements almost coincide, forming a ring about 8 mm. in diameter, and just within them the thickness of the capsule is about 18 microns, being somewhat less at the actual site of zonular attachment. Centrally from the maximal point it gradually becomes thinner, without any distinct step, to the polar thin spot in the center.[35] The zone of maximal thickness, according to Salzmann, corresponds to the concavity in the posterior curvature reported by Zeeman and von Pflugk, as the bands of thickening in the same relative position on the anterior capsule correspond to Tscherning's region of anterior flattening in accommodation. The adult capsule Saltzmann described as a homogeneous, structureless, elastic membrane, highly refractive, very firm and resistant to chemical and pathologic influences. Its elasticity has been experimentally shown by Druault[38] who found that it would eject water after distention.

Of great possible interest is a formation recently discovered by Friedman[39] in the eye of a mouse embryo, consisting of a conical mass of mesenchymal cells which form a pad on the posterior lens surface in the early stage of vitreous development, but disappear later. Friedman thinks that this pad is present also in the human embryo, but has hitherto been overlooked. If so, its presence may give rise to the "saucer-shaped cataract" sometimes seen on the posterior lens surface, and may explain some forms of quasi-lenticonus.

---

36. Mann, Ida C.: Nature and Boundaries of the Vitreous Humor, Tr. Ophth. Soc. U. Kingdom **47**:172, 1927.

37. Salzmann, M.: Anatomie und Histologie des menschlichen Augapfels im Normalzustande, Leipzig, Franz Deuticke, 1912, p. 177.

38. Druault (footnote 32, p. 1124).

39. Friedman, B.: Development of the Lens: Its Significance in the Interpretation of Lenticular Abnormalities, Arch. Ophth. **6**:558 (Oct.) 1931.

For understanding certain theories of posterior lenticonus, the anatomy of the anterior vitreous is also necessary. Detailed knowledge of its development is not necessary, and would lead into controversial ground. The most recent consensus seems to be about as follows:[40] The anterior surface of the vitreous, including the fossa patellaris, is limited by a delicate pellicle, or layer of condensation, called by some the hyaloid membrane, though others dispute the title, on the basis rather of definition of terms than of fact.[41] This membrane lies in close apposition to the lens capsule, but is separated from it by a capillary space containing a thin layer of fluid. The existence of this space has been demonstrated by Redslob,[42] who injected carmine solution into it and showed it to be circular in outline and limited by a ring, presumably the capsulo-hyaloid ligament. He thinks that its purpose is to prevent friction between the two surfaces during the change of curvature of the lens in accommodation. About 1 mm. behind this anterior vitreous surface is the curtain seen with the slit-lamp, sometimes called the front curtain of the vitreous; it is simply the line of union between the close-meshed secondary vitreous and the looser-meshed primary vitreous. This primary vitreous occupies the dark, so-called retrolental space, and represents the embryonal capsula perilenticularis fibrosa; its backward projection occupies, or forms, the hyaloid canal of Cloquet, the wall of the canal being continuous with the "curtain," into which it is inserted, as Mann[23] has shown. Through it the hyaloid artery passes before dividing into the network of branches which form the tunica vasculosa lentis. The terminal branches reach the lens in the third fetal month, within a circle about 1 mm. in diameter, which at that stage is near the periphery of the lens. The remains of the vessel may be seen with the slit-lamp, normally somewhat nasally from the pole and slightly below, as Vogt has repeatedly pointed out.[43] The arc line seen with the slit-lamp is about 1 mm. in radius and

40. (*a*) Cowan, A.: Concerning a Membrane Between the Vitreous and the Anterior Chamber, Tr. Am. Ophth. Soc. **29**:179, 1931. (*b*) Verhoeff, F. H.: The Condition of the Ocular Structures Immediately After Removal of the Lens in Capsule, as Determined by Microscopic Examination, ibid. **29**:184, 1931. (*c*) Kirby, Daniel B.: The Anterior Vitreous—in Health and Disease, ibid. **29**:193, 1931.

41. Cowan, A., and Fry, W. E.: The Hyaloid Membrane of the Vitreous, Am. J. Ophth. **15**:428 (May) 1932.

42. Redslob, E.: Étude de la structure du vitre, Ann. d'ocul. **164**:125 (Feb.) 1927.

43. Casey Wood, in the American Encyclopedia and Dictionary of Ophthalmology (Chicago, Cleveland Press, 1913, vol. 2, p. 985), quoted Mittendorf as saying that about 1 per cent of patients exhibit minute dotted opacities of the posterior lens capsule outside the visual axis, which he regards as hyaloid remains. Wood said that it is evident to any one who has studied birds' eyes that the hyaloid artery is a vestigial pecten.

commonly envelopes the hyaloid vessel remains more or less completely. Vogt [44] regards it as representing the anterior end of the hyaloid canal, and in this he is supported by Gallemaerts.[45] Mann, however, said that it represents the circle within which the branches of the artery reach the lens, and that it does not represent the final stage of Cloquet's canal. Kirby added [40c] that the remains of the hyaloid vessel are attached to the anterior condensation layer of the vitreous and not to the lens capsule.

The vitreous is anchored fast by the attachment of its fibrillar structure to the ora serrata, in a union which Salzmann has called the "base of the vitreous." Thence it bulges forward to form a sort of shoulder, over which pass the posterior fibers of the zonule, and then curves back into the depression of the fossa patellaris. Redslob stated [42] that the retrolental part of the vitreous is more fluid than the lateral parts.

THEORIES OF ORIGIN

Various theories have been advanced to explain this unusual anomaly, all necessarily speculative to a greater or less degree, as the early stages have never been recognized, or the process itself observed. Fisher [46] did indeed report observing the development of a protrusion at the posterior pole, following a blow on the head which he supposed to have ruptured the capsule, but that was in pre-slit-lamp days, and his diagnosis of lenticonus has been questioned by several critics. Anatomic evidence is lacking, for those cases microscopically reported are rejected by clinicians as presenting an entirely different condition, and no clinically observed case has yet been studied in section.

The theory of a new growth of lens tissue—"phakoma"—has been abandoned for lack of any evidence or any probability in its support, and the kindred idea of a distorted or deformed growth is in the same position. A related, but much more plausible hypothesis assumes an inflammatory or pathologic process of the tunica vasculosa lentis, which would cause changes in the capsule and interfere with the nutrition of the lens. Von Szily especially has emphasized this idea,[23] describing the polar capsule as a *locus minoris resistentiae* for several reasons, one of which is the collection on its surface, at a certain stage of development, of excreted detritus to be carried away by the branches of the hyaloid vessels. Through this process, he said, the growth of the capsule may be delayed, and the capsule may even be perforated by branches of the hyaloid artery, which then make their way through the sutures deep into the layers of the lens. Such a process, it is conceivable, might

44. Vogt (footnote 11, p. 379).

45. Gallemaerts, Émil: Tunique vasculaire du cristallin et lampe à fente, Ann. d'ocul. **165**:82, 1928.

46. Fisher, J. Herbert: A Case of Traumatic Posterior Lenticonus, Ophth. Rev. **32**:97, 1913.

explain a case like Bothman's. The idea is supported to some extent by a similar explanation given by Loewenstein [47] for certain manifestations in the anterior part of the lens. On the other hand, many cases show not only no rupture of the capsule, but even no apparent thinning. Among those stressing this fact is Butler, who has propounded a most ingenious theory of an inclusion, by the infolding of a stem of a vessel, which then produces pressure disorganization of the fiber layers, and formation of the "collar-stud" opacities that he and Tyson observed, while the projecting lips of the fold form the conus. He does not claim any great probability for the idea.

Now, it would seem elementary that the causation of any condition should be discussed in its simplest terms, and the explanation sought in the type form, not in the complications. None of Butler's cases, as it happens, was of what I have called the first, or type, class; neither was Vogt's first case, which Butler saw, nor apparently, was von Szily's. So none of these explanations explains the primary type: the clear transparent hemisphere, with intact and transparent capsule, on an otherwise normal lens. This phenomenon must be explained before one begins to account for the atypical or complicated cases.

Traction by the hyaloid artery at the posterior pole, if it could be shown to occur, might account for everything but the shape, for, as implied in my former paper, and now distinctly stated by Vogt, a pull from behind could never produce a hemisphere. But there is no reason to suppose that such traction ever is or could be exerted, sufficient for the purpose. The artery breaks and disappears at its hinder end while the branches are still enmeshed in the tunica vasculosa lentis, and no posterior lenticonus has been described with a complete persistent hyaloid artery. If Kirby is correct in saying that the hyaloid remains are attached to the anterior condensation layer of the vitreous, and not to the lens, they could not exert traction in any event. Most important of all, Vogt has conclusively shown that the normal site of hyaloid attachment is outside the globus area, as it has indeed been reported in numerous cases beside his own. Butler alone has reported one case with the hyaloid remains attached at the summit. So Vogt had no hesitation in saying: [48] "Today it may at least be considered as established that lenticonus posterior is not, in general, produced by a pull from behind."

The theory of a hernia of lens substance within the capsule—as distinguished from a prolapse through the capsule—remains to be considered. For such a hernia to result in a transparent hemispherical protrusion, the following factors are mechanically essential: a thinned

47. Loewenstein, A.: Ueber die Genese angeborener Linsentrübungen, Klin. Monatsbl. f. Augenh. **87**:382 (Sept.) 1931.

48. Vogt (footnote 11, p. 453).

or weakened and yielding but intact capsule; a supporting ring of some sort to form the margin; a contained mass sufficiently plastic to occupy the bulge without losing its optical lucidity; a fluidity of the vitreous sufficient to allow space for the protrusion, and pressure, developed within the lens or applied from without, sufficient to form a displacement. In the absence of any one of these factors, either no change of form would take place, or one of a different character.

Before regarding these factors singly, I shall take up here the time of formation, since the conditions affecting it vary with age. It appears to be generally held at present that the defect is of congenital or, at the latest, of very early postnatal origin, but within this range opinions differ. A developmental anomaly of some sort must certainly underlie the formation, but need not determine the time of it. The assumption of congenital origin is based on the general nature of the defect, and the involvement of the deeper (older) lamellae in certain cases. But it has already been shown that location has only a negative value as an index of age. Changes not inherently structural in character may arise in the older layers from chemical or nutritional disturbance at any time up to old age, and there is nothing characteristic of the cases in the type class which might not arise at any time of life; in them the deeper layers are not affected. Moreover, I have found no report of veritable lentiglobus in a child under 6 years of age. This, of course, constitutes no argument that these cases do not exist earlier, but it does constitute lack of evidence that they do. So the period of formation must be left open, as undetermined and perhaps varying.

Returning now to the individual factors, one finds the hypothesis of a weakened capsule generally accepted; indeed the assumption is unavoidable unless such excessive force as would overcome normal capsular strength can be demonstrated. Laceration or gaping of the capsule has already been ruled out, as an intact capsule has been observed in many cases. For the causes of weakening, one is forced back on speculation. Interference with nutrition through abnormality of the vascular tunic has been mentioned already. Formation of cataract is given by some writers as a source of weakness, but Vogt pointed out that, as between bulge and cataract, it is impossible to say which is the cause and which the effect. Roughening, or rippling, noted on the inner surface of some of the most transparent capsules appears to be the result of stretching, rather than a cause of weakness. Cataract is not present in all cases. Persistent embryonal remains should produce thickness, rather than thinning, but might cause deterioration in quality. Without actual observation, a definite statement is impossible.

Granted a yielding capsule, a confining ring is mechanically necessary to give a sharply defined segment; otherwise there would be a

general curved swelling. Vogt described in one case a double change of contour, with doubling of the ring reflex, as if one globe were superimposed on another. In such case, one may suppose a double ring, one within the other, and in the cases in which the edge is rounded, rather than sharp, the ring may take the form of a band. As to its nature, one is again driven to speculation. None has ever been seen. In the description of my case, the transparent and optically structureless character of the margin is emphasized, as well as its sharpness. The same is true in the illustration of Vogt's second case. I have tried to think that the capsulo-hyaloid ligament might by some chance have been formed in this exceptional location, but the description of it given by Salzmann makes this seem improbable. More reasonably one may suppose that the zone of maximum capsular thickness has been contracted from a normal diameter of 7 mm. to about 2 mm. Vogt, who regards the arc line as the anterior end of the hyaloid canal, thinks [48] that this line and the canal may have a definite relation to the etiology of posterior lenticonus, being influenced thereto by the presence, in the fellow eye of one of his patients with lenticonus, of a distinct arc line in the exactly corresponding position. Colombo also suggested that the mouth of Cloquet's canal may provide a niche for the reception of a lenticonus.

Next to be considered are fluid or plastic contents. The lens substance, one may recall, consists of flexible lens fibers, or "lental tubules," and a small amount of liquid, which collects especially at the posterior pole. If pressure is applied, this collection of liquid would act exactly like a dilator bag, pushing the yielding area of capsule out into the vitreous. This process being intermittently repeated, the capsule would stretch and slacken, the fluid contents of the fibers would be squeezed down into the ends near the pole, these ends would then also dilate, and the newly growing fibers, as their ends approached the pole, would be crowded in the same backward direction. As, however, the movement of the fibers is limited to their growth, the fiber mass occupying the globus would be rather loose, and the proportion of liquid greater than in normal lens substance, in accord with Vogt's statement that the substance in the globus was even more lucid than in the normal lens. If this process of stretching and separation of the fibers continued, one might begin to see evidence of internal stress, separation of sutures and lamellar surfaces and loose fiber ends, as suggested in the drawings of Reese,[49] and, still later, clouding and opacities, as pictured by

49. Interesting for comparison is a drawing in Bach and Seefelder's Atlas zur Entwicklungsgeschichte des menschlichen Auges (Leipzig, W. Engelmann, 1911, plate XVI, fig. 6) showing cut ends of lens fibers across the sutures. This drawing is of an embryonal nucleus; Reese's drawing of an adult nucleus and cortex (compare also figures 51, 52 and 53 in Mann [29]).

Butler and Tyson. These phenomena would thus appear as secondary effects of the lentiglobus formation, rather than as factors in its origin.

If the vitreous were a firm, uniform gel, or a perfect fluid, enclosed within a rigid sclera, no bulge of the lens could occur. This argument was used by von Helmholtz [50] with regard to posterior thickening of the lens in accommodation, but, as Luedde said, Helmholtz did not know that the vitreous has a structure and so is not subject to the simple law of hydrostatics. I have cited Redslob on retrolental fluidity, and Salzmann on attachment at the "base": I shall return to them again.

I come now to the final essential factor: the source of the pressure required to force out the contents of the lens. Lacking this, and in the absence of traction without, no bulge would occur. It might be caused by internal swelling or excessive growth of the lens, but there is no evidence that any such internal tension ever exists. The only alternative is pressure from without, applied to or on some other part of the capsule than the posterior pole. Vogt ascribes this essential rôle to the elastic tension of the capsule itself, acting as in accommodation, according to the later form of the Helmholtz theory. This hypothesis is reasonable, and is, on the whole, the most plausible so far put forward, if it agrees with the facts. But doubt arises whether the lens capsule has actually sufficient elastic strength for the purpose, its elastic power being a subject of considerable dispute. If it alone produces the accommodative changes in the lens form, it must have a good deal. On the other hand, Luedde quoted an experiment by Hess [50] to show that in youth it has not sufficient strength to maintain the form of a lens placed on a flat surface. In that case, it would hardly produce unaided a hernia lentis.

A short digression at this point may be helpful. At the opposite pole of the lens is occasionally found the much rarer anomaly, lenticonus anterior. In reporting a case of this kind, Kienecker expressed the opinion that the two conditions have nothing in common but the name. However that may be, certain interesting comparisons may be drawn. For one thing, each term has been applied to a number of entirely different conditions, varying, anteriorly, from the curious protuberance which Francis,[51] with justifiable hesitation, called "atypical anterior lenticonus" to the increased conicity of the surface seen in active accommodation. Regarding only cases which most nearly resemble the type form of posterior lenticonus, Kienecker [52] has reported bilateral

50. Quoted by Luedde, W. H.: Mechanism of Accommodation, Arch. Ophth. **7**:40 (Jan.) 1932.

51. Francis, L. M.: An Unusual Congenital Anomaly of the Crystallin Lens (Atypical Anterior Lenticonus?), in Finnoff, W. C.: Contributions to Ophthalmic Science, Edward Jackson Birthday Volume, Menasha, Wisc., George Banta Publishing Company, 1926, p. 112.

52. Kienecker, Rudolph: Ueber einen Fall von doppelseitigen sogenannten Lentiglobus anterior, Klin. Monatsbl. f. Augenh. **82**:55, 1929.

occurrence in a man aged 42, with a vague history of good sight in early life. The conus, somewhat flattened, protruded through the pupils into the anterior chamber, clear and readily transparent, the lens being without opacity or other defect except the form, but the lines of discontinuity following the curve of the surface as far back as the outer embryonal nucleus, resembling in this respect Butler's drawings. In discussing the origin, he barred congenital defect, for lack of any change or scar in the nuclear layers, lens surface or cornea. He referred to two cases reported to have arisen at puberty, and inclined strongly to the belief that they are all related to an accommodative strain. Moved by this case, Feigenbaum [53] reported a very similar one in a 10 year old boy, which had definitely increased under observation through a period of two years. Duane [54] likewise reported two cases of moderate anterior lenticonus, one of which increased from 2.50 to 7 diopters in nine years and the other from 4 to 7 diopters in three years, the patients being from 20 to 30 years old. There is no recent report of a posterior lenticonus watched over a period of years, except in Vogt's first case, which was in a middle-aged patient and complicated by cataract. I saw the patient in my case at 9 years, and again at 20, but there is no basis of comparison, as no adequate record was made the first time and there was then no slit-lamp. It is the same with Riedl's [12] slit-lamp study of a lens reported some years previously by von Jano.

Kienecker's attribution of the conus formation to accommodative effort lends interest to a comparison with the mechanism of accommodation in birds. As described by Kalt,[55] the soft lens of the bird's eye is pushed against a rigid iridociliary ring and bulges through, producing a great increase in the convexity. Commenting on this, Kalt said: "In considering the changes incident to accommodation in birds' and reptiles' eyes, the term anterior lenticonus becomes a reality." Another mechanism of accommodative pressure, under comparable conditions, might well have the effect which Kienecker ascribes to it.

Has this conception any interest in the study of lenticonus posterior? It seems to me not only that it has, but that, taken in conjunction with the previous estimate of the theory of lental hernia, it has sufficient value to justify the proposition that lenticonus posterior is not essentially a congenital or developmental anomaly, but may be the result of accommodative strain, under unknown but favoring conditions, in the highly plastic lens of a young child. Any one who has watched a baby

53. Feigenbaum, Aryeh: Lentikonus Anterior, Klin. Monatsbl. f. Augenh. **83**: 35, 1929.

54. Duane, A.: Tr. Sect. Ophth., A. M. A., 1919, p. 328.

55. Kalt, M. E.: L'appareil oculaire dans la série animal, in Encyclopédie français d'ophtalmologie, Paris, Lagrenge and Valude, 1906, vol. 2, p. 836.

focus on an object held in the fingers before popping it into the mouth can realize the amount of accommodative effort involved.

This thesis has the weakness of resting not only on the still unproved hernia theory, but also on another, which is yet far from winning general acceptance by the profession, namely, Tscherning's theory of accommodation and especially Luedde's modification thereof.[56] The pull of the ciliary muscle on the capsule should be considerably greater than the elastic pull of the capsule itself, which Vogt regards as the source of energy: the simultaneous forward and outward pull on the vitreous at its "base" would draw the vitreous away from the center, and so lessen its resistance to lental protrusion at the pole. I admit that I have no evidence in support of this theory, but am by no means sure that evidence may not be found. This is not the place to go into the relative merits of the Helmholtz-Tscherning controversy, but a careful slit-lamp study of the accommodative changes, if any, in a lenticonus, anterior or posterior, in a young person might throw light not only on the nature of lenticonus but on the Tscherning theory also. A change in width, depth or contour, associated with accommodative effort, would indicate a change of intracapsular lental tension; smallness of movement and a difficult angle of observation might prevent detection of any change. A careful study, in a suitable case, might bear valuable fruit.[57]

In the meantime, it is interesting to recall that every eye with lenticonus, whose refraction I have found reported, had appreciable hyperopia or hyperopic astigmatism, save two, and of those two at least one had appreciable myopic astigmatism; in other words, they were under direct stimulus to accommodation.

SUMMARY

Before progress can be made in understanding the nature of lenticonus posterior by the study of reported cases, some definition must be accepted and a classification of variations instituted. A tentative scheme of classification is offered.

The anatomy and development of the parts involved are briefly reviewed.

A critical analysis is given of the various theories which have been advanced to explain this anomaly. Explanation must be sought in terms of the simplest or type form, and not in terms of the many and varied complications. Certain conditions requisite for formation are given.

The proposition is advanced that lenticonus is not essentially a congenital or developmental anomaly, but is produced by the strain of accommodation under unknown but favoring conditions.

56. Luedde, W. H.: Am. J. Ophth. **10**:15, 1927; footnote 50.

57. Unfortunately, my case is no longer available for study.

CONCLUSION

Finally, it must be said that much more will have to be learned about this condition before definite conclusions may be drawn as to its nature, or even before definite classification is established. The process of formation must be observed, in the early stages especially, and clinically observed and recorded cases must be studied in microscopic section. An attempt in one of Butler's cases to extract the lens in the capsule for study unfortunately failed. For full understanding, not only the deformed lens must be microscopically studied, but the entire eye, with the lentiglobus in situ. As the condition is rare at best, particularly in the type form, and as it does not of itself indicate enucleation, the prospect of early solution is dim. Meanwhile, every case discovered should be carefully observed and reported in detail, as to both the lentiglobus itself and all related complications.

CHOKING OF THE OPTIC DISKS IN DISEASES OTHER THAN TUMOR OF THE BRAIN

JOHN T. STOUGH, M.D.
CHICAGO

In making a diagnosis of intracranial tumor the physician seeks for evidence of what is known as choking of the optic disks. It is not necessary to explain the meaning of this term. Neither is it necessary to go into details concerning the cause of choking of the optic disks. Suffice it to say that the evidence favors the view that it is due to obstruction of the return flow of blood from, perhaps also lymphatic drainage of, the retina. This may be due either to local obstruction along the course of the optic nerve or to a general increase in the intracranial tension. If the ophthalmologist could always be certain of the diagnosis of choking of the optic disks and if this finding were produced only by intracranial tumor, it would be very helpful. Unfortunately other conditions of the retina may simulate choking of the optic disks, and this finding may be produced by other diseases than intracranial tumor. Having seen, in the course of the last few years, several cases of definite choking of the optic disks with other symptoms suggestive of intracranial tumor in which the subsequent course of the disease seems definitely to rule out this diagnosis, we thought that it might be useful to present these cases for consideration.

It has been known for a long time that one of the lesions most difficult to differentiate from choking of the optic disks is optic neuritis. And there are many cases which have been supposed to be due to infection around the teeth or sinuses and other causes. Another condition difficult to differentiate is the retinitis of cardiovascular renal disease. Although in typical cases of so-called albuminuric retinitis there should be no difficulty in differential diagnosis, there seem to be cases of hypertension without any marked renal or cardiac lesion in which the fundi present a picture identical with that of choking of the optic disks with increased intracranial tension. The first case was of this type.

REPORT OF CASES

CASE 1.—Mrs. C. B., the patient, aged 53, was referred by Dr. L. L. Charpier. She was admitted to the Billings Hospital, Jan. 29, 1932, complaining of a productive cough and night sweats for eight months, bloody expectorations for a few

From the Division of Ophthalmology, Department of Surgery, University of Chicago.

Read before the Chicago Ophthalmological Society in association with Dr. Percival Bailey, March 21, 1932.

days, nocturnal dyspnea for six weeks, pain in the chest on deep inspiration for four weeks, loss of strength and loss of 25 pounds (11.3 Kg.) in weight in eight months. She had known of the hypertension for three years. Her mother died at the age of 52 of a stroke.

Physical examination revealed a well developed woman, comfortably sitting in bed but breathing rapidly, the heart enlarged to the left, the apex in the fifth interspace 14 cm. to the left of the midsternal line, a systolic murmur best heard at the apex and transmitted to the axilla, a blood pressure of 210 systolic and 148 diastolic, impaired resonance over the bases of both lungs, the liver 3 cm. below the costal margin and very tender, a rectocele and cystocele and inflamed hemorrhoids. There was from 1 to 3 plus albumin in the urine; the blood urea nitrogen was from 13.8 to 20.5 mg. per hundred cubic centimeters, the blood count normal and the Wassermann reaction negative. An electrocardiogram revealed a left axis deviation with slight notching of the auricular wave. An orthodiagram revealed a cardiac enlargement of 71 per cent.

The visual acuity was not taken because of the patient's condition. Examination of the fundus revealed a swelling of each disk to 2 diopters, with enlargement to twice the normal size and definite bending backward of the vessels as they passed off the apparent disk margins. There were a few hemorrhages on the disks, with cotton wool patches on the temporal side of each disk. The arteries were narrowed, but the veins were normal and showed slight nicking where they were crossed by the arteries. The patient was discharged from the hospital on February 20 in only a slightly improved condition.

This is a case of primary hypertension in a malignant phase with cardiac enlargement and myocardial insufficiency, cerebral and renal arteriosclerosis and bilateral choking of the optic disks.

Usually in patients of this type the hypertension exists more or less alone with very little evidence of involvement of the heart or kidneys as in the following case.

Case 2.—Mrs. M. H., the patient, aged 41, was referred to the Billings Hospital by Dr. Harold Smith. She was admitted on Dec. 2, 1931, with a history of hypertension. This was first detected during pregnancy in 1927, with a subsequent gradual rise in the blood pressure, associated with headaches and with visual disturbances for seven months. There was also a history of nocturia and of dyspnea on exertion. She had been treated, but without noticeable effect.

Physical examination revealed a moderate enlargement of the heart (43 per cent over the normal size by orthodiagram), whipcord-like radial arteries and slight pitting edema of the ankles. The blood pressure ranged from 210 to 260 systolic and from 154 to 176 diastolic. There were no signs of involvement of the nervous system apart from the eyes.

Ophthalmologic examination showed vision of 0.8 in the right eye, vision of 0.6 (corrected) in the left, moderate retinal arteriosclerosis and marked choking of the disks, each measuring 3 diopters. There were many hemorrhages and some striation of the nerve fiber layer beyond the disk, but no star figure of the macula was seen. The peripheral fields were normal. The blind spots were enlarged to two or three times the normal size.

Laboratory tests showed an occasional trace of albumin, a few hyaline and granular casts, normal blood urea nitrogen with 60 per cent renal function, a negative Wassermann reaction of the blood and normal blood counts. There was

a slight increase in the pressure of the spinal fluid (190 mm.) with no evidence of block. The T waves in leads I and II were inverted, with left axis preponderance, as shown by the electrocardiogram. The patient was discharged Dec. 18, 1931.

This is a case of marked hypertension with malignant signs as evidenced by bilateral choking of the optic disks, retinal, renal and peripheral arteriosclerosis, a high diastolic blood pressure and definite cardiac enlargement, in which no signs of tumor of the brain could be found.

In both of the preceding cases the cause of the swelling of the optic disks was fairly easy to establish, but we have seen other adult patients in whom the etiologic factors were much less obvious, as for example in case 3.

CASE 3.—J. F., the patient, a colored woman, aged 37, was referred to the University Clinics on Dec. 17, 1931, by Dr. Theodore K. Lawless. She complained of blurring of vision for six weeks, with only slight improvement in the last week, and headaches definitely associated with the menses for twenty years, with no change in their frequency, severity or time of occurrence.

The general examination gave negative results except for a blood pressure of 170 systolic and 120 diastolic. With rest in bed the blood pressure diminished to 150 systolic and 110 diastolic. Roentgenograms of the skull, optic foramina, chest and heart were normal, as was also an electrocardiogram. Neurologic examination gave negative results except for some slight increase of the tendon reflexes on the right side and a fine nystagmus when looking to the extreme left. Examination of the eyes showed a vision of 1.0 in the right eye and a vision of 1.2 in the left. The optic disks were swollen in mushroom fashion, the right one to 5.5 diopters and the left to 4.5 diopters, with flame-shaped hemorrhages on and surrounding the disks and with engorgement of the capillaries of the disks and the retinal veins. The peripheral red and white fields were normal as taken on several occasions, and the blind spots were enlarged from two and one-half to three times the normal size. Since the hypertension was slight, other possible causes were sought for.

No localizing signs of a lesion of the brain being found, a ventriculogram was made December 29, at which time no increase in the intracranial pressure and no filling defect of the lateral or third ventricles were found. There being no indication for surgical intervention, the patient was discharged on Jan. 3, 1932.

This was thought to be a case of hypertension of the primary type, since no nephritic symptoms were found. It is possible that in this case the choking of the optic disks was due to hypertension, but the evidence is not good.

In case 4 there was no evidence whatever of hypertension and the only possible etiologic factor found was some infection about the teeth.

CASE 4.—M. M., the patient, aged 32, was first seen in the University Clinics on May 13, 1931. She gave a history of intermittent headaches for four months, blurred distant and near vision, obesity since childhood and recent menstrual irregularities.

Physical examination revealed an obese woman, weighing 253 pounds (114.7 Kg), with a blood pressure of 120 systolic and 92 diastolic. There was

tenderness over the left parietal region. The patient's skin was smooth and infantile and her cheeks were flushed with many telangiectases. Motor power, tone and coordination were good, but all of the deep reflexes were absent. Examination of the cranial nerves gave negative results except for the optic nerve.

Examination of the eyes revealed: vision of 1.2 in the right eye, which was corrected by + 0.50 sphere, with + 0.50 cylinder axis 90, to 1.5; vision of 0.3 in the left eye, which was corrected by + 1.00 sphere + 0.75 cylinder axis 90 to 0.8. The exophthalmometer readings were 20 mm. for each eye. The ocular movements were normal except for a slight limitation of left abduction. The pupillary reactions were normal.

Examination of the fundi revealed swelling of the optic disks (the right to 3 diopters and the left to 4 diopters), engorgement of the veins, narrowing of the arteries and definite bending backward of the vessels over the margins. There were numerous large and small hemorrhages on the disks and at the apparent disk margins. The maculae were normal. The peripheral fields showed no defects and the blind spots were enlarged to three times their normal size.

Roentgen examination of the skull, optic foramina and sella turcica revealed no definite evidence of intracranial disease.

The Wassermann and Kahn tests gave negative results. Both the dextrose tolerance and the water balance tests were normal. The basal metabolism rate was + 1.

Clinical and roentgen examination of the teeth revealed definite dental infection of six teeth.

The patient went home on May 16, 1931, to think over other procedures which had been proposed, and returned to the hospital on May 25, 1931. On May 25 a bilateral ventriculogram revealed the ventricular fluid to be under no pressure, and air passed through freely from the right to the left ventricle. There were no filling defects of the lateral ventricles and they were not dilated. There was very little air in the third ventricle and none in the fourth ventricle.

On June 6, 1931, the ophthalmologic examination revealed an improvement of the corrected vision (R.V. = 1.5 —2; L.V. = 1.2 —2), but with an increase to 5 diopters of swelling of the right disk and 6 diopters of the left disk. The peripheral fields were normal with the perimeter and Bjerrum screen (1/1,000) and there was no change in the blind spots. The patient was discharged from the hospital on June 4, 1931.

She had all of her teeth removed between August 12 and October 12. Many of these teeth were abscessed around the roots and the gums. She felt much better after this. Unaided vision of the right eye on October 12 was 1.5 — 4, and unaided vision of the left, 0.8 + 1, with some haziness of the margins of each disk still remaining; the left disk was still elevated 2 diopters and hyperemic. Both of the disks were of a good red color. The peripheral fields were normal and the blind spots reduced to about one-third their former size.

The last examination, on November 14, revealed vision and peripheral fields unchanged, but the left disk was still somewhat elevated. The known duration of the choking of the right disk was five months. There was evidence of choking of the left disk after six months.

In this case I can say only that the teeth were possibly the cause of all of the patient's symptoms.

Finally, we should like to present a patient who had in all probability a hemorrhagic neuroretinitis but in whom there were definite swelling of

the optic disks and marked cerebral symptoms, so that an operation on the cerebellum was advised.

CASE 5.—F. N., the patient, aged 28, was referred to the University Clinics by Dr. Peter Bassoe and admitted to the hospital on Nov. 5, 1929. He complained of intermittent headaches for the past five or six weeks. This was associated with diplopia and crossing of the right eye. Vomiting had occurred three or four times a week during the past four weeks. General examination gave negative results, with a blood pressure of 130 systolic and 80 diastolic. Neurologic examination revealed: tenderness over the upper cervical vertebrae and occiput in the midline, weakness of the right side of the face, right-handedness but with better gross strength in the left hand and arm and slightly less tone in the upper extremity, coordination good, abdominal and cremasteric reflexes stronger on the left side than on the right and a positive Oppenheim and Gordon sign on the right side. The patient's gait was very unsteady, with a tendency to fall to the left.

Ophthalmologic examination revealed the eyes to be parallel and there was a vertical nystagmus on extreme gaze. The disks were enlarged to three times the normal size with an elevation of the right disk to 4 diopters and of the left to 1 diopter. There was considerable engorgement of the veins with many large and small hemorrhages. The retina surrounding the disks was involved by edema and hemorrhages. The peripheral fields were concentrically contracted and the blind spots were enlarged. A diagnosis of right and left hemorrhagic neuroretinitis was made by the ophthalmologist.

Roentgen examination revealed no gross evidence of a lesion involving the bones of the skull, and only a possibility of some erosion of the inner tables of the skull in the left occipital region. A neurologic diagnosis of tumor of the posterior fossa in the midline was made. An operation was advised, which the patient refused. A letter was received from his physician on Sept. 7, 1930, stating that he was fully recovered except for choroiditic lesions and a great loss of vision in the right eye. The last report, on Dec. 29, 1931, stated that the patient had been working continually since Sept. 24, 1930, with no recurrence of the previous trouble.

This is presumably a case of pseudotumor with definite fundus changes which were probably an optic neuritis.

So much for adults. In our experience these puzzling cases have been much more common in children. One of the causes for choking of the disks concerning which considerable has been written lately is lead poisoning. Children are apt to eat unusual things, in particular, to chew the paint off their cribs, but the child in case 6 obtained paint from a paint bucket.

CASE 6.—B. E., the patient, aged 6 years, was seen in the University Clinics and admitted to the Bobs Roberts Memorial Hospital on Oct. 15, 1930. She had had difficulty in walking for four weeks previous to her admission. There had been some epigastric pain, occasional vomiting and loss of appetite. No history of poisoning could be obtained at first, but after she had been in the hospital several days it was found that she had eaten some paint.

General examination gave negative results except for a bilateral peroneal extensor weakness (foot drop) which was more evident on the right side than the left. Examination of the blood showed the lowest hemoglobin estimation to be 65 per cent, a red cell count of 3,510,000, a white cell count of 8,600, 54 per cent

polymorphonuclears, 46 per cent lymphocytes, degeneration of the red cells and basophilic stippling. The Wassermann and Kahn tests of the blood were negative.

Examination of the eyes showed a possible early right neuritis and normal peripheral fields.

The patient was discharged on Oct. 27, 1930, and returned to the hospital on November 11, with some lethargic manifestations and foot drop. The red blood cells still showed stippling. Ocular examination showed a definite swelling of the right disk to 2.5 diopters and of the left to 2 diopters, with hemorrhages, tortuosity and dilatation of the veins followed by a fibrinous exudate on the disk and more hemorrhages the next day. The peripheral fields were normal. The vision of the right eye was 0.4 —1; that of the left, 0.4 —2.

Neurologic examination on November 11 revealed no evidence of cerebellar involvement. The neurologist was of the opinion that the condition might be due to an intracranial tumor, and advised that a ventriculogram be made. This was done and the ventricular fluid was found to be under diminished pressure. Roentgen examination showed a normal ventricular system. Repeated examination of the eyes showed the highest choking of the disks to be 3 diopters on November 24. On December 2, there was a complete right and partial left external rectus palsy and a questionable right superior oblique palsy. The exophthalmeter readings were 17 mm. for each eye, which is slightly higher than normal for a child of this age. At this time it was thought that the left peripheral field showed a superior nasal notching, but the fields taken later were normal. On December 17, the fundi showed a marked improvement, the elevation of each disk being 1 diopter; each had a yellowish tinge and showed more the picture of a neuritis. On Jan. 6, 1931, the external rectus palsies had almost completely disappeared as well as the choking of the disks, so that ophthalmologic examination gave negative results. Vision on February 17 was 1.0 in each eye.

Examination of the feces on Nov. 13, 14 and 16, 1930, by the coroner's toxicologist showed a total of 22.6 mg. of lead excreted, the normal for adults being 1.25 mg. daily.

This is a case of acute lead poisoning with peripheral neuritis and bilateral choking of the optic disks.

In one other case the cause of the swelling of the optic disks was definitely established, this time by necropsy.

Case 7.—C. J., the patient, 20 months old, was referred from the Children's Memorial Hospital and admitted to the Bobs Roberts Memorial Hospital at the University of Chicago, Jan. 4, 1932, with a history of increased irritability and general apathy for one month. There was also difficulty in using the right leg and arm for seven days. When admitted, the child had a slight hydrocephalus. He was able to sit up in bed, but unable to stand. There was some weakness of the right arm. He was anemic looking, continuously blinked his eyelids and had a mild ptosis and spontaneous nystagmus. Each disk showed a swelling, which was not measurable because of the nystagmus. The disks were yellowish and showed secondary atrophy. Roentgen examination showed the cranial sutures to be separated. The Wassermann reaction of the blood was negative. The blood count was normal, but the hemoglobin was low (40 per cent).

Cerebellar tumor was suspected, so a suboccipital exploration was made on January 7, at which time the ventricular fluid was found to be under considerable pressure. A large cisterna magna was exposed and punctured. Fluid seemed to come down freely from above. There was no evidence of neoplasm in the vermis

or either cerebellar hemisphere. The left lateral ventricle was filled with air, and roentgenograms were taken. These showed the ventricular system to be normal.

On the fifteenth postoperative day a swelling developed beneath the scalp in the occipital region. This was aspirated daily, yielding from 110 to 125 cc. of yellowish cerebrospinal fluid. On the afternoon of January 27, the child had a generalized clonic seizure relieved somewhat by another withdrawal of fluid, the last part of which was definitely bloody. The patient died of respiratory failure at midnight.

Postmortem examination revealed thrombosis of all the dural sinuses and most of the superficial cortical veins as well as a large intracerebral hemorrhage in the medial part of the right hemisphere. The cause of the thromboses was not found.

No evidence of neoplasm was found.

In most of our cases we have never been able to determine what might have been the cause of choking of the optic disks. We will present three typical cases.

Case 8.—E. S., the patient, a girl, aged 4 years, was transferred from the Children's Memorial Hospital to the Bobs Roberts Memorial Hospital of the University of Chicago July 17, 1931, with a history of headaches and vomiting for three weeks, crossing of the left eye and stiffness of the neck muscles for a period of one week. The remainder of the history and physical examination was unimportant.

Neurologic examination revealed a cracked-pot resonance of the head, hypotonia of the extremities, decomposition of the movements of the left hand and, at times, a bilateral Babinski phenomenon.

In the ophthalmologic examination, attempts to take the visual acuity and peripheral fields were unsatisfactory. There was a bilateral sixth cranial nerve paresis, more marked on the left side than the right. The right disk was swollen to 4 diopters and the left to 3 diopters. They were enlarged to twice the normal size and showed numerous hemorrhages.

Roentgen examination revealed a diastasis of the sutures and digital markings on the inner tables of the skull, pointing to an increase of the intracranial tension without localizing signs of a tumor of the brain.

A midline cerebellar tumor was suspected. A suboccipital decompression and cerebellar exploration were made on July 23, 1931. The cerebrospinal fluid was found to be under moderate pressure. Thorough examination of the cerebellum revealed nothing abnormal. The surgical wound healed promptly.

Subsequent examinations of the eyes revealed a gradual reduction in the choking of the disks, so that on August 11, this measured less than 1 diopter with only slight pallor of each disk. The left eye still turned in on August 26. The color of the disks was fair, with only a questionable pallor in the temporal quadrants. The patient had been given roentgen treatments following the operative procedure and was much improved at the time of discharge, on August 27.

On October 10, she returned to the hospital for roentgen therapy. At this time the function of the left external rectus muscle had returned, so that the eyes were parallel. There was no recurrence of the choking of the disks. The patient was discharged on October 27.

On Jan. 5, 1932, the patient again returned to the hospital for roentgen therapy. During the interval since she was last seen she had had the whooping cough, from which she recovered satisfactorily. No neurologic defects could be found. Roentgen examination of the skull revealed no separation of the sutures. She was discharged on January 18.

In this case it cannot be definitely stated that there was no tumor. None was seen, but the tumor might have been favorably influenced by the roentgen treatments. We are inclined to believe, however, that there was never any tumor. At operation no herniation of the cerebellar tonsils, fulness of the vermis or other signs of an expanding lesion were found.

Case 9.—E. S., the patient, a boy, aged 4 years, was referred to the Bobs Roberts Memorial Hospital by Dr. Hans Reese of Madison, Wis. He was admitted on Nov. 9, 1931, with a history of headaches and vomiting of nine weeks' duration. Examination revealed an early cracked-pot note on percussion of the skull, hypotonicity of all extremities, bilateral choking of the disks of about 2.5 diopters and some bilateral external rectus paresis. Roentgen examination showed slightly widened coronal and sagittal sutures. There was also definite asynergy of the hands when the child handled objects.

As a cerebellar tumor was suspected, an exploratory operation was made November 13, revealing only a greatly dilated posterior cisterna and no definite evidence of a tumor. When the patient had recovered from the operation an encephalogram was made, 80 cc. of fluid being withdrawn. Following this procedure his condition improved. A careful ophthalmologic examination was difficult because the patient moved his eyes continuously. At the time of his discharge, on December 6, no choking was discernible and the bilateral rectus palsy had disappeared.

During recovery from the operation this patient had a persistent hyperthermia and increased intracranial pressure which necessitated repeated punctures and final drainage of the wound. For nearly three weeks any attempt to close the drainage resulted in a high fever, which finally disappeared. The discharge ceased a few days before he left the hospital.

Case 10.—A. G., the patient, a girl, aged 11 years, was first seen in the eye clinic, University of Chicago, on Sept. 5, 1929. A diagnosis of bilateral papilledema was made. Her illness began two weeks previous to her admission to the clinic. She complained of a dull ache above both eyes and soreness below them on awakening. Two days after the onset, vision in the left eye was suddenly lost; two days later there was a similar loss of right vision. The patient could distinguish objects only when they were held close and directly in front of her. Her vision had improved slightly two or three days before admittance. She had been nauseated for three days, but had not vomited. She had had a dizzy spell for half an hour without loss of consciousness. She had noticed a weakness of both legs for the last twenty-four hours. There had been a tingling in the right leg for only a few minutes. There was no record of any acute febrile disturbance.

The results of a general physical examination were negative. The blood pressure was 95 systolic and 50 diastolic. Neurologic examination, aside from the eyes, gave negative results. With the right eye the patient could see only movements of large objects when near by. With the left eye she could barely distinguish light. The ocular movements were normal. There was no nystagmus. The pupils were dilated and reacted sluggishly to light and in accommodation. The right disk was of good color, with blurred margins, and was elevated to 3 diopters. The arteries were contracted, the veins and disk capillaries were congested and there were several fine hemorrhages on the disk. The left disk was similar to the right except that the temporal margin was fairly clear and the elevation measured 2

diopters. The peripheral fields examined with a large test object were only moderately contracted. A roentgenogram of the skull showed no sign of increased intracranial pressure. The sella turcica was normal. The optic foramina were of normal size. A ventricular puncture was made on September 7. There was no increase in the pressure of the cerebrospinal fluid. The ventricular system was found to be normal. The child was discharged on September 11 and returned for examination on September 17, at which time the vision was 20/200 in each eye. The peripheral fields were contracted from 5 to 10 degrees. The temporal margins of the disks were sharply defined with definite paling of the temporal half of the left disk and suspected paling of the temporal half of the right disk. The nasal borders of the disks were still indistinct. Ten days later the right vision was 0.8 — 3 and the left vision 0.6 — 3. The peripheral fields were unchanged, although the left showed more contraction than the right. The disks were flat. There was some paling of the temporal half of the right one. The temporal half of the left disk was definitely pathologically pale, and there were signs of absorption of the disk hemorrhages. On Feb. 25, 1932, the right vision was 1.0 — 4. The left vision was 1.0 — 1, corrected. Examination of the fundus revealed only a definite chalky white pallor of the disks, especially in the temporal halves, being a little more marked in the left eye. The peripheral fields were normal and the blind spots were enlarged to about one and one-half times the normal size. Although this was a picture of primary atrophy, it was in reality a secondary atrophy without changes in the peripheral fields. This picture of atrophy is found frequently in young persons.

COMMENT

It seems to be reasonably certain that there was in the last two cases some sort of inflammatory condition. For instance, in case 10 the rapidity of the onset with the rapid failure of vision is much more characteristic of a neuritis than of choking of the optic disks from pressure, and in case 9 the long-continued febrile course following operation would seem to indicate that the patient previously had had some sort of obscure inflammatory process. We can point also to the patient previously discussed with the multiple thromboses of intracranial veins as an indication of the possibility of an inflammatory factor being at the root of these conditions. Since these patients rarely die but recover with more or less visual defects, depending on the case, it is difficult to obtain positive information concerning the cause of the conditions. But we are inclined to believe that these obscure chronic conditions are inflammatory in nature and that the so-called pseudotumors are in reality chronic encephalitis from one cause or another. It is quite possible that when the acute condition has subsided, thickening of the meninges occurs with disturbance in the circulation of the cerebrospinal fluid so that the condition known to the neurosurgeon as chronic arachnoiditis or to the physician as serous meningitis would be the final outcome. In the latter cases one usually finds in the eyes what appears to be a primary optic atrophy. This does not necessarily prove that there has not previously been an increase in the intracranial tension.

Particularly in children the choking of the disks may subside with a picture which cannot be distinguished by the ophthalmologist from a primary optic atrophy. Since the sutures close quickly in children following the relief of intracranial hypertension, such an acute encephalitis might pass by more or less unnoticed and be forgotten and only the end-result come under the observation of a physician at a much later date.

TRANSPLANTATION OF THE LACRIMAL SAC IN CHRONIC SUPPURATIVE DACRYOCYSTITIS

J. A. MacMILLAN, M.D.
MONTREAL, CANADA

All ophthalmologists recognize that excision of the lacrimal sac is a most effective operation for the removal of suppuration in dacryocystitis. Nevertheless, the discomfort from tearing which frequently follows, even after removal of the accessory lacrimal gland, has induced various surgeons to attempt, by more conservative means, to overcome the suppuration by reestablishing lacrimal drainage.

The first of these methods was the "dacryocystorhinostomie" of Toti,[1] which was described by him in 1904, and has since been modified by others, especially Dupuy-Dutemps [2] and Mosher.[3] In 1910, West [4] advocated his intranasal operation, although this route had been used first by Caldwell [5] in 1893. Since then various modifications of this operation have also been described.

In 1919 Dr. Gordon Byers, my chief in the department of ophthalmology at the Royal Victoria Hospital, assigned to me all lacrimal cases suitable for the West operation, with a view to incorporating this more conservative procedure in our practice, if justified by results. After having carried this out on a series of cases, it occurred to me that if one could incise the lacrimal sac transversely just above the obstruction and transplant its end into the nose through a new opening in the lacrimal fossa, one would have an epithelial lining to insure patency. This idea was carried out and I made a preliminary report on the method in June, 1921.[6]

Read before a Joint Meeting of the Canadian Medical Association and the Ontario Medical Association, Toronto, Canada, June 23, 1932.

1. Toti, M. A.: Technique systématique de la dacryocystorhinostomie, Ann. d'ocul. **143**:417, 1910.

2. Dupuy-Dutemps and Bourguet: Procédé plastique de dacryocysto-rhinostomie et ses résultats, Ann. d'ocul. **158**:241, 1921.

3. Mosher, H. P.: The Mosher-Toti Operation on the Lachrymal Sac, Laryngoscope **31**:284, 1921.

4. West, J. M.: Zur Chirurgie des Tränenweges, Arch. f. Laryng. u. Rhin. **27**:224, 1913.

5. Caldwell, G. W.: A New Operation for the Radical Cure of Obstruction of the Nasal Duct, New York M. J. **58**:476, 1893.

6. MacMillan, J. A.: A New Operation for the Treatment of Lacrimal Obstruction, Am. J. Ophth. **4**:448, 1921.

As the procedure at present is somewhat simpler than that previously described, a brief description of it as now carried out is as follows:

A skin incision, from 12 to 15 mm. in length, is made extending from the median palpebral ligament down and slightly outward, following the direction of the anterior lacrimal crest (fig. 1 *A*). As this crest is continuous below with the orbital margin, the direction is easily followed. The orbicularis muscle is then split, exposing the sac covered by fascia. The median palpebral ligament and its attachment are an infallible guide as the sac lies immediately behind it (fig. 2 *A*). The further dissection is carried on below the ligament, which is left intact, thus also sparing the canaliculi. After the sac is well exposed it is freed anteriorly and posteriorly by dividing the fascia. In large dilated sacs the procedure is easy as the fascia is much thinner, while in narrower sacs one has to divide the fascia vertically along the anterior and posterior crests, allowing it to remain attached to the outer wall of the sac. This is left *in situ* to hold a suture which is to be inserted. The sac is now freed down to the entrance of the canal, where it is cut completely across (fig. 2 *B*). A stout silk suture is then passed through the fascia and the outer wall of the sac and the sac is lifted upward with a retractor

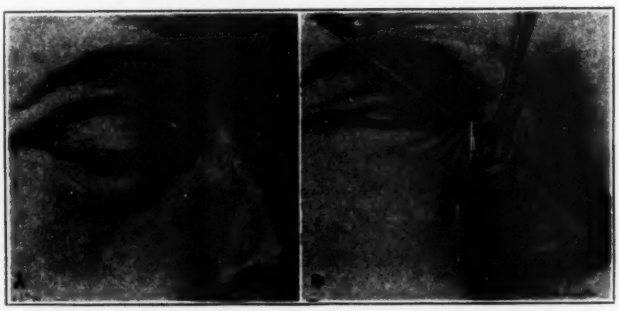

Fig. 1.—*A*, skin incision; *a* and *b*, injection points for the local anesthetic. *B*, lacrimal fossa exposed, with an opening made in the lacrimal bone after the sac has been cut and drawn upward.

so that the lacrimal fossa is exposed. An opening is next made into the nose through the fossa. As a rule, a portion of two bones constitutes the fossa, the anterior by the frontal process of the superior maxilla, which is dense, and the posterior part by the thin lacrimal bone (fig. 1 *B*). I shall mention later the variations in this respect. A punctum dilator easily perforates the lacrimal bone high up near the median palpebral ligament, and it is then enlarged with the blunt end to a size big enough to admit the sac (from 3 to 4 mm. in diameter). Both ends of the silk suture can now be passed through the opening into the nose and picked up by a pair of nasal forceps. This is often difficult, as the opening is high up under the anterior end of the middle turbinate. I have found it easier to pass a fine filiform bougie through the opening so that it slips backward under the middle turbinate and appears in the pharynx. A rubber catheter is now passed through the nostril of the same side until it also reaches the pharynx (fig. 3 *A*). Both are withdrawn from the mouth and tied together. On drawing the catheter from the nostril it is followed by the filiform bougie and then the suture which has been tied to it. Once the suture comes out of the nostril it is drawn firmly and the sac is inserted into the new opening. By tying the two ends of the suture over a piece of gauze, inserted into the nostril for the purpose, the sac is held in the

opening (figs. 2 *C* and 3 *B*). Three skin sutures are inserted, a pad of gauze is placed over the incision, and a firm bandage applied.

The plug in the nose may be changed on the second day to avoid odor, and removed completely on the fifth day, when the sac suture may also be withdrawn and the skin sutures removed. The lacrimal syringe may be used, but if all is clean about the wound, this may be left for another week.

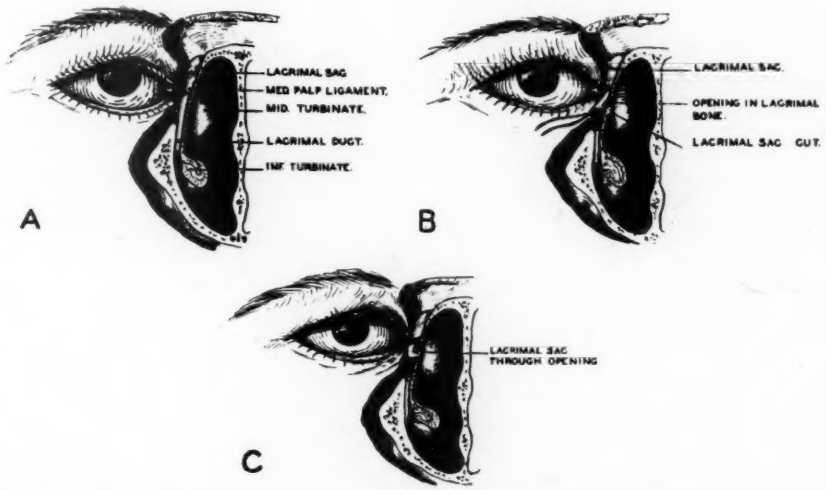

Fig. 2.—*A*, a vertical cross-section showing normal relations in the lacrimal region. *B*, a vertical cross-section showing the suture in the sac after it has been cut across, and the new opening into the nose. *C*, vertical cross-section of the lacrimal sac through opening.

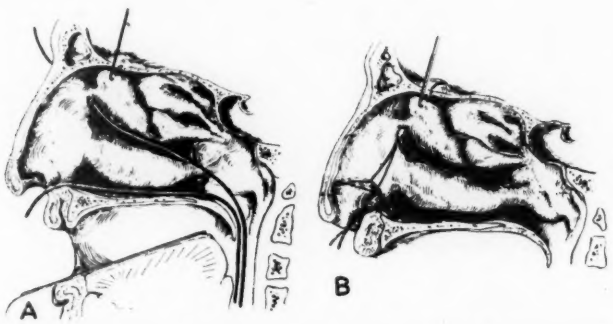

Fig. 3.—*A*, a sagittal section showing a bougie through the opening extending into the pharynx, and a catheter in the inferior meatus. The middle turbinate has been lifted upward. *B*, same as *A*, but with lacrimal sac through the opening, and a suture tied over gauze in the nostril.

The operation is carried out under local anesthesia. A line is taken between the infra-orbital foramen and the inner canthus, and 2 cc. of a 2 per cent procaine hydrochloride-epinephrine solution is injected at about the junction of the lower and middle thirds of this line, which catches the branches of the infra-orbital nerve going to the region of the lacrimal sac. About 5 minims (0.31 cc.) of the same

solution is injected subcutaneously, fairly high up, in the inner angle of the orbit to catch the supratrochlear and infratrochlear branches coming down (fig. 1 *A*). A pledget of cotton-wool, placed in a 10 per cent solution of coccaine and epinephrine and squeezed dry, is inserted high up under the anterior end of the middle turbinate. It is also well to give a hypodermic injection of morphine, one-fourth grain (0.0162 Gm.), before the operation.

RESULTS

Since November, 1920, twenty-five operations of this type were performed on twenty-three patients; eleven were men and twelve women. Twelve of the operations were on the left side, and thirteen on the right. The youngest patient was 22 years of age, and the oldest 62. Of this number, sixteen operations were done before December, 1921, and only nine since then. This is due to the fact that I partially lost interest, but this interest was revived by the enthusiasm of some of the patients, especially so by one man who had this procedure on one side, and an excision performed on the opposite side. In 1923 I collected the results in the sixteen cases, and found that ten were cured; that is, there was no discharge and no tearing, with normal lacrimal patency. Three were improved, with little or no discharge but with tearing and no patency with the syringe except after probing, and three were failures. In one of the failures ectropion immediately followed the operation, and was, I think, responsible for the failure. The ectropion was probably caused by a detachment of Horner's muscle from the posterior crest while freeing the sac—an unusual and unnecessary accident. The sac was afterward excised. In this series of sixteen cases no attempt at selection was made before operation. The patients were treated in order as they appeared at the clinic. As a result of my experience with the series, however, I feel that certain types are more suitable for this particular operation. The chronic cases showing large sacs, that is, those from which a large amount of pus regurgitates on pressure, seemed to be the most satisfactory. The reason is that here the lumen of the sac is large, its walls are thick and the obstruction is low down. The nine cases in which operation was performed since 1923 were of this type and the results are as follows: Seven patients are completely well and have been seen or heard from lately. The patient in the most recent case was operated on ten months ago. One has not been heard from, but was well when last seen, and the other is improved. This patient has a blocking at times which is easily relieved by probing. In this last case the bony opening made at the operation was small, although it was as large as I could make with the punctum dilator. This led me to make further investigation on the bony relations of the lacrimal fossa. As already stated, the anterior part is formed by the frontal process of the superior maxilla. It is dense and impossible to perforate with a punctum dilator, while the posterior part, which is formed by lacrimal

bone, is as thin as paper. I formerly thought that each bone formed half the fossa, but on examining one hundred and six lacrimal fossae in the department of anatomy at McGill University I found that in seventy-eight the suture between the two bones was in the center of the lacrimal fossa (fig. 4 *A*). In nineteen the suture was far back, so that the whole inner wall of the fossa was formed by the frontal process of the superior maxilla (fig. 4 *B*). In eight the whole inner wall was formed by lacrimal bone (fig. 4 *C*), and in one skull the lacrimal bone was absent (fig. 4 *D*). These figures do not vary greatly from Whitnall's findings.[7] It can be seen that in the cases in which the

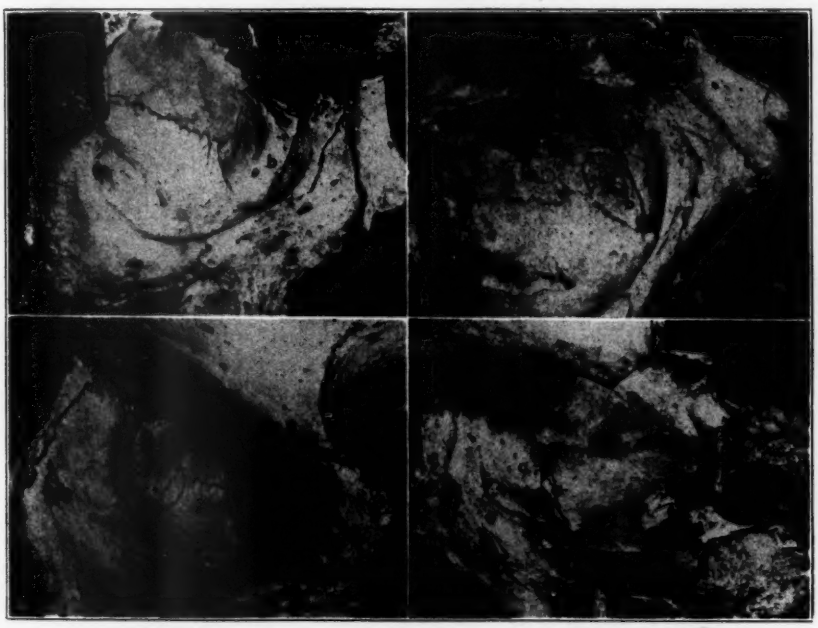

Fig. 4.—*A*, lateral view of the lacrimal fossa, showing suture between the frontal process of the superior maxilla and lacrimal bone in the center of the fossa. Each bone forms half the fossa; *a*, frontal process of the superior maxilla; *b*, lacrimal bone. *B*, same as *A*, but suture is far back near the posterior lacrimal crest so that fossa is formed by the superior maxilla. *C*, same as *A*, but suture is far forward so that the lacrimal bone forms almost the entire fossa. *D*, absence of the lacrimal bone.

superior maxilla forms the inner wall it would be difficult to make an opening large enough to admit the sac without resorting to a burr or chisel, which I have not used up to the present. I think that this is responsible for the one failure in the last nine cases.

7. Whitnall, S. E.: The Naso-Lacrimal Canal: The Extent to Which It Is Formed by the Maxilla, and the Influence of This upon Its Calibre, Ophthalmoscope **10**:557 (Oct.) 1912.

CONCLUSIONS

The advantages of this procedure seem to be that it is simpler than the external methods described. Moreover, less bone is removed and there are no flaps of mucous membrane to deal with. It is quite in the field of ophthalmology, so that no profound knowledge of nasal work is required, as in the intranasal operation. Finally, if after the operation is started the procedure cannot be accomplished successfully, the sac may be removed through the same incision.

Prof. S. E. Whitnall of the department of anatomy at McGill University provided anatomic material for this study.

ANTIQUITY OF THE FORMS OF THE TRANSPARENT OCULAR MEDIA

LAURANCE D. REDWAY, M.D.
Instructor in Ophthalmology, Columbia University; Research Associate in Anthropology, Peabody Museum, Harvard University
OSSINING, N. Y.

The transparent tissues of the eye are the cornea, the aqueous, the lens, the vitreous, the retina and the conjunctiva. Morphologically they may be classified as follows:

Epiblastic	*Mesoblastic*
Conjunctiva	Aqueous
Cornea	Vitreous
Lens	
Retina	

Preponderantly they are of epiblastic origin, but the aqueous, as far as present belief is concerned, must be classified as mesoblastic together with the vitreous. Here, then, are tissues from two distinct embryonic sources, following widely divergent courses of differentiation, occurring nevertheless in the same location with the common attribute of transparency, and only in that location. It is true that translucence is found elsewhere in the body, but usually as a function merely of the thinness of the structure involved. However, the transparency of the ocular media occurs irrespective of the characteristic of thinness, as exemplified in the vitreous and the lens, although this characteristic occurs in diminishing amount in the cornea, the retina and the conjunctiva respectively.

Two hypotheses are possible: Either the transparent media of the eye now represent an evolutionary synthesis of a high order of differentiation from other tissues common to the organization or they represent slightly modified forms of older, possibly primeval, certainly primitive structures. A glance backward down the evolutionary trail of the vertebrates and the prevertebrates discloses the fact that an increasing transparency is encountered the more simple the forms become. This general observation would lead one away from the hypothesis of greater complexity toward that of the simpler forms in any inquiry into the origin and nature of the transparent media of the human eye.

Does one not have to go far back into the dim recesses of the remote past to find a force powerful and compelling, a large source of energy,

Read before the Association of Physical Anthropologists, Smithsonian Institution, Washington, D. C., March 21, 1932.

constant, old as the sun itself, operating coercively on rudimentary polycellular forms of life in a medium of sea water in order to explain phenomena of which one now sees only the perfected form and function? Is it by mere chance alone that of those structures and tissues composing the transparent media of the eye, four are epiblastic in origin? Or is this related to the fact that in those far-off eons the epiblasts were first and, because of their position on the *outside* of the envelop, more directly and more powerfully influenced to form some sort of transmissive and receptive organ?

It is impossible philosophically to conceive of a will to see or of an instinct to construct an organ of vision antecedent to the existence of the means to its accomplishment, namely, the presence of light; on the contrary, granted primarily the presence of light, and, in view of the present knowledge of its physical nature and structure, nothing is more reasonable than that it should have been seized on by the rudimentary intelligence as an unfailing, powerful stimulant around which to shape its structure and development. The study of any embryo reveals the first presence of the rudimentary central nervous system, epiblastic in origin, and later the protuberance from the fore brain of the optic stalk. Is there no significance in the tissues of origin or in the chronologic succession of events culminating in the early formation and completion of the transparent media of the eye?

Haeckel has pointed out the historical significance of certain physical phenomena, based on the theory that the ontogeny repeats the phylogeny. Certainly much of the greatest importance historically is locked away in the structure and form of the transparent tissues of the eye. Is one correct in assuming a mesodermal origin for the vitreous on the basis merely of modern histologic evidence, or were cornea, lens and vitreous historically one original structure? What is the historical significance of the presence of capsular epithelium only on the anterior half of the lens? Conceive of a primitive nervous system, surrounded by an envelop of epiblasts, submerged in sea water and acted on by the powerful stimulus of light. Such a condition, to go no further back, would be satisfied by the embryo of Amphioxus, shown by Gabriel Costa, in 1834, to be a fish related to the order of Cyclostomata, and so named by William Yarrell in his History of British Fishes in 1834. This fish, in the opinion of Henry Fairfield Osborn, may well stand as an example of the connecting link between the invertebrate and the vertebrate orders as "in Amphioxus the balance is so far on the other or vertebrate side of the scale (as compared with the Balanoglossus and the Ascidians) and this with its resemblance to lower forms, gives us the connecting link between Protochordate and Chordate organization." It thus comes to lie, at all events, not far from the true ancestral line of the vertebrates, and is certainly related to the lampreys and hag-fishes.

Costa remarked its peculiar sensitivity to light, but was not able to demonstrate the presence of eyes. Its length varies from 4 to about 8 cm. in the adult state, and in the fresh condition it is semitransparent. Histologically the integument is of extraordinary interest to the ophthalmologist, for it seems to afford much historical background for the vertebrate cornea. Figures 1 and 2 are diagrammatic representations of the integument of Amphioxus and of the human cornea. The comparison is too obvious to need much critical comment as far as structure is concerned, but the common characteristic of transparency is to be

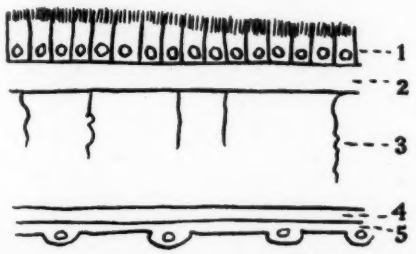

Fig. 1.—Integument of Amphioxus (after Hatschek): *1*, epidermis; *2*, outer layer of cutis (basement membrane of Hatschek and Spengel); *3*, middle layer of cutis; *4*, inner layer of cutis; *5*, epithelial layer of cutis (limiting membrane). (Reproduced from Willey, E. H.: Amphioxus and the Origin of the Vertebrates, New York, Columbia University Press.)

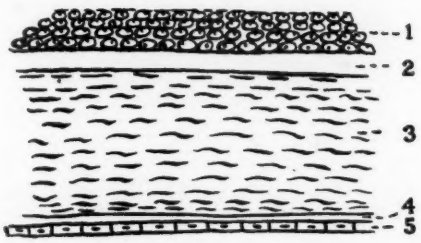

Fig. 2.—Human cornea: *1*, epithelium; *2*, Bowman's membrane; *3*, stroma; *4*, Descemet's membrane; *5*, endothelium. (Reproduced from Fuchs, E.: Text-Book of Ophthalmology, ed. 8, Philadelphia, J. B. Lippincott Co., 1924.)

noted. Of the connective tissue system of Amphioxus, Willey said that its salient feature is the great preponderance of the gelatinous element; and of the outermost layer of the cutis and the innermost layer of the sheath of the notochord, that they are "composed of a peculiar and very highly refringent and homogeneous tissue." Here avascularity and homogeneity of tissue are combined to produce transparency.

Thus it begins to appear that with regard to the vertebrate cornea, at least, this structure, instead of being a highly complex product of evolutionary differentiation, is a rather simply modified retention of a

primitive cuticular form. And as such, it fits in with, and affords a powerful argument in support of, the contention that all the transparent media of the eye are simple modifications of primitive structures retaining a primitive characteristic of transparency while all else about them has undergone a complex evolutionary synthesis, and that this synthesis

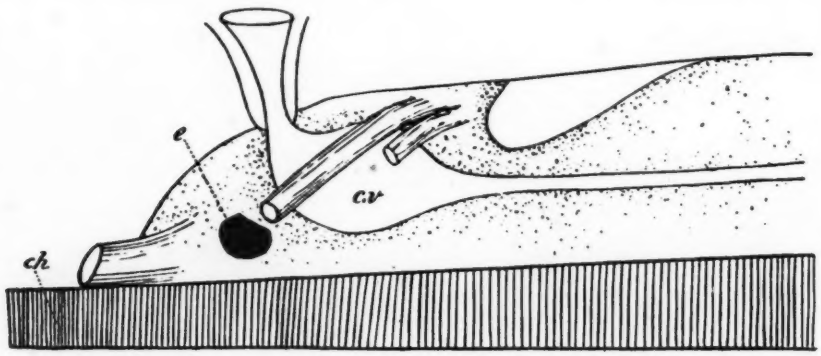

Fig. 3.—Relation of eye spot to notochord in Amphioxus: *e*, eye spot; *ch*, notochord; *c.v.*, cerebral vesicle. (From Willey.)

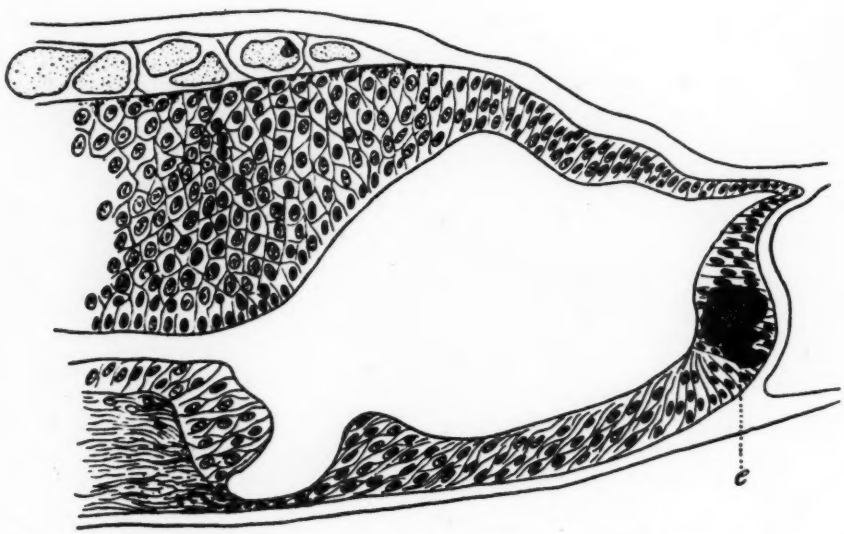

Fig. 4.—Pigmented cells of cerebral vesicle walls in Amphioxus: *e*, eye spot. (From Willey.)

has involved a corresponding loss of one of the most primitive of all characteristics, namely, transparency.

At the anterior end of Amphioxus, dorsal to the notochord and in the median line is the eye spot. Figures 3 and 4 show this in its anatomic relationship to the notochord and to the cerebral vesicles respectively. It is a single organ and lies at the immediate anterior extremity

of the dorsal nerve tube. Figure 4 shows it to be merely a cluster of pigment granules in the epithelium of the anterior cerebral vesicle wall. So at this stage of the vertebrate evolution the animal is provided with a transparent epidermis, a means of transmitting light, and with a receptive mechanism for its interpretation by the central nervous system.

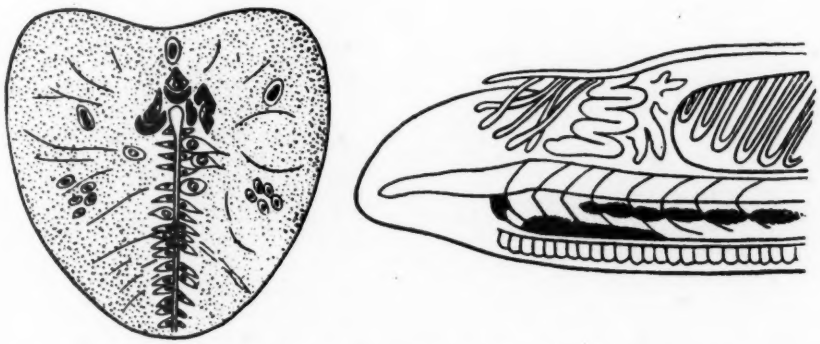

Fig. 5.—Pigment distribution in central nervous system of Amphioxus. (From Willey.)

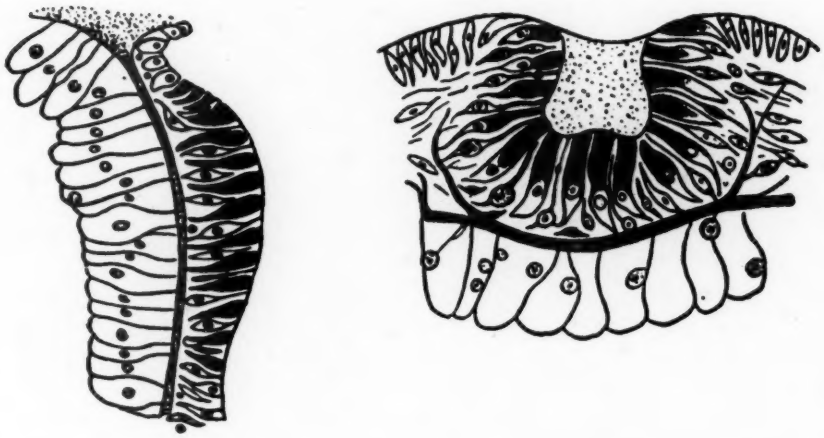

Fig. 6.—Invertebrate eye or ocellus. Clusters of pigmented epithelial cells. (From Willey.)

It is interesting to speculate on the behavior of the whole animal in relation to light falling on it. As it is semitransparent and somewhat cylindric in shape and of a refractive index greater than water, rays of light and also radiant heat falling on the envelop would everywhere be bent inward toward the longer axis. Is the pigment, or more properly was the pigment, originally developed in the epithelium of the central nervous system a response to spectral rays of light or to radiant energy

in the form of heat? In Amphioxus there are a rudimentary cornea and what might be termed a rudimentary retina, but of the lens or vitreous there is no trace. Nor in all conscience should there be, for if the state of intelligence corresponding to the degree of development of the animal is examined, it becomes apparent that a formed image of external objects could not be of the slightest use or purpose. In Ascidia, notably Ciona intestinalis, a simple sessile form, the presence of a lens is noted

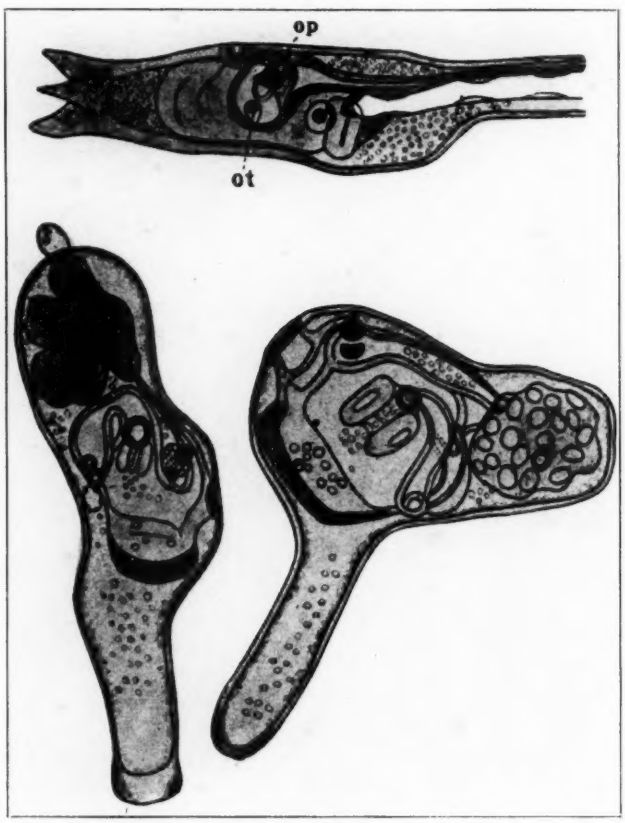

Fig. 7.—Ciona intestinalis (after Hatschek): *op.*, optic vesicle with horseshoe shape lens arising from cells of the vesicle itself; *ot*, otocyst. (From Willey.)

together with an otocyst. Figure 7 shows the cerebral vesicle, the eye and the lens from the left side. It is interesting to note the apparent formation of a lens by cells derived from the wall of the cerebral vesicle. It must be remembered that this is a myelonic eye, one typical of the vertebrates and not the invertebrate type, in which the cells of the retina are derived from the external ectoderm. It is therefore comparable with the eye of Amphioxus, but seems to represent a more advanced state by virtue of the presence of the lens. That the lens in

Ciona should be derived from the wall of the cerebral vesicle is interesting when contrasted with the development of the lens in the vertebrates of higher orders from the external ectoderm. It is true that one here contrasts eyes from two different sources. That of the tunicates, to which Ciona belongs, is probably related to the pineal or parietal eye of Lacertilia (fig. 8), as pointed out by Baldwin Spencer, while the paired eyes of the craniate vertebrates are certainly not so derived or related (fig. 9).

Nevertheless it is of considerable historical interest in a consideration of the transparent media to note that a structure with the same func-

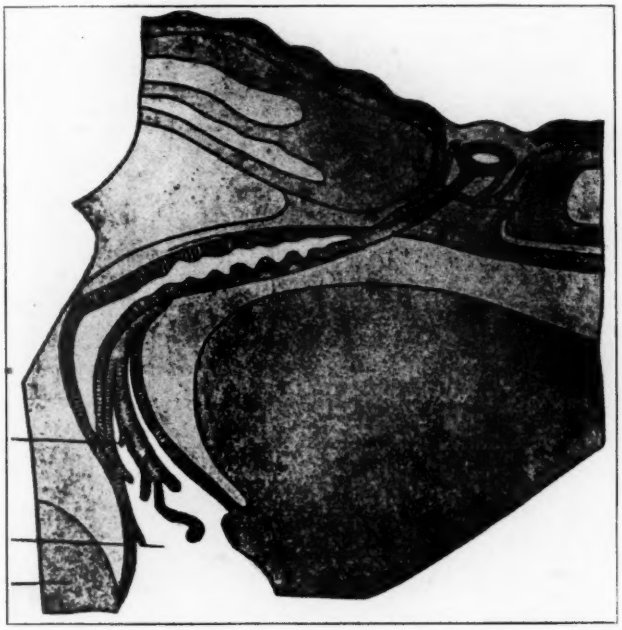

Fig. 8.—Vertebrate or myelonic eye (after Willey). Modified cuticular scale functioning as a cornea.

tional objective could be and has been derived from two distinctly different tissue sources, viz., the external ectoderm and the epithelium of the cerebral vesicle. It is highly probable that one sees here the beginnings of distinct functional cleavage between the ectoderm and the epithelium of the vesicle wall. Where mere perception of light ceases and the formed image supersedes it, then certainly there arises the necessity for more complex functions. Apparently there was some indecision as to the allocation of the more complex functions, for sooner or later there had to be at least two: (1) the transmission of energy as light, and (2) the transmission of energy as a nervous force. In the tunicate eye apparently the central nervous system attempted to create its

own lens. But this creative capacity lay more logically within the province of the ectoderm, since the lens is concerned with the transmission of energy as light. Such a derivation of special organs from suitable tissue sources may account for the eventual formation of the lens from the ectoderm and not from the cerebral vesicular epithelium in the paired eyes of the vertebrates. This would constitute a structural limitation based on restraints exercised by a difference in functional objectives.

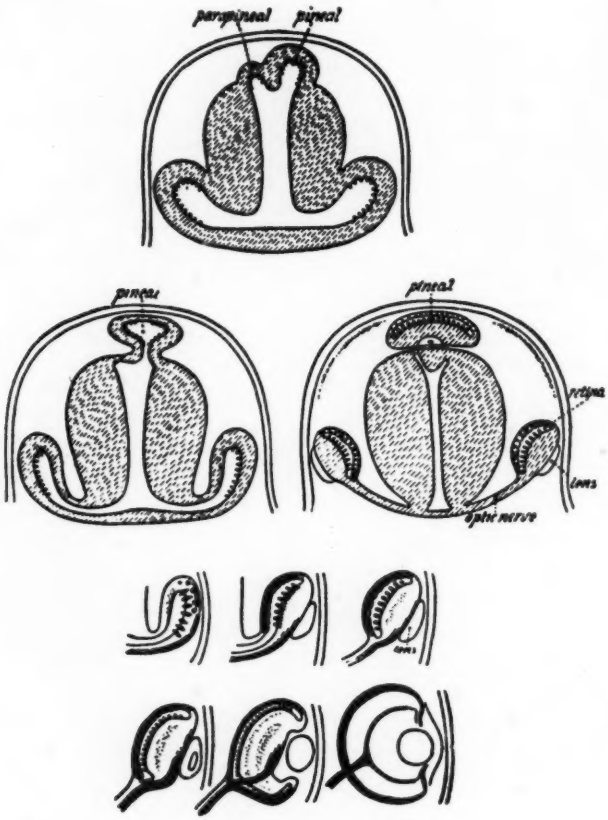

Fig. 9.—Probable origin of pineal gland and later development of lateral paired eyes of vertebrates. (Reproduced from Gregory, W. K.: Our Face from Fish to Man, New York, G. P. Putnam's Sons, 1929.)

In the realm of comparative zoology a few examples are found of anophthalmos in fishes, and in mammals the mole of the family of Talpidae is popularly supposed to be anophthalmic but is in reality microphthalmic. Nowhere to my knowledge does there now exist any example of intermediate stages in the evolutionary development of the transparent media of the eye. It would seem that this physical characteristic either does or does not exist in all eyes whether they are normal,

microphthalmic, cryptophthalmic or macrophthalmic, excluding of course, those instances of pathologic development affecting the individual and not the species. In such examples some interruption has presumably occurred in the course of embryonic life to affect the ordered and rhythmic processes of biochemic synthesis.

It must therefore follow that in so far as the ocular transparent media are regarded, evolution of these forms must have been complete at a period far antedating even the most remote antecedents of the genus. And of very few structures of the body can this be said. Functional deviations and structural adaptation of other organs have followed a long and varied developmental course under the stresses of changing environment and different conditions of nutrition and metabolism, *but the singleness of the functional objective of the eye has remained constant* through geologic eons, save for the one major change—the substitution of air for sea water as the external medium of ocular contact.

Too much stress can hardly be laid on the importance of the single and the fixed objective in any consideration of the functional and structural development of the transparent media of the eye. Too often, on the contrary, it is forgotten. The eye itself does one thing, and one thing only. It is concerned solely with the transmission of light rays and their conversion to nerve impulses. It accomplished this function originally submerged in sea water. It concerned itself with no side issues; it took the light that originally called it into being and transmitted it—simply that and nothing else. Subsequently, when mammals became land animals, the external environment of the eye was changed by degrees to air and water and then solely to air. And even that change was modified and abated by the manufacture of tears almost isotonic with sea water. There is something in the concept of the developing vertebrates attempting to carry along with them some of their original pelagic environment in the form of tears which is singularly arresting to the imagination. It argues strongly that originally light, sea water and metamorphosing protoplasm were necessarily linked together, and that subsequently this triad was sufficiently interdependent to make necessary special apparatus to continue the manufacture of a medium no longer available in its natural state. Thus a constancy of functional purpose and a nearly undeviating environmental fixation have almost succeeded in producing in the eye a static form in nature about which all else has altered. The very nature of the visual function is such as to preclude there ever having been a long drawn out course of ocular evolution; for there is possible either seeing or not seeing; a merely light-perceptive mechanism could not long exist as such only, for an imperfect tool is either further developed to the limit of its functional capacity or else discarded. Of such nature would have been an eye with merely translucent media—a curse and an abomi-

nation. Yet this must have been at some phase of the prevertebrate evolutionary curve the intolerable situation of the animal possessing a central nervous system with visual aspirations; either this or, as an alternate hypothesis, the highly improbable assumption of the sudden creation of a vastly complex optical system out of what and by what means it would be even more impossible to explain than to conceive. And yet, in so far as these media are concerned, if the necessity for a rapid transition from rudimentary to completed forms is conceded, the rigid fixation of these forms in a final state must be viewed as equally necessitous in the light of the unchanging requirements of the functional objective, namely the transmission, focusing and conversion to nerve impulses of the light rays.

One should expect to find as the constituent elements of these media cellular entities now ill adapted to withstand (with the possible exception of the conjunctiva) any change either external or internal which may be imposed on them, since whatever mechanisms of defense they may have developed have all been directed through the long course of their functional history to the maintenance of their fixed characteristics and against any attempt to alter these, due to the constancy of the fixed objective. To that end even the supreme offensive and defensive weapon of the circulation has been made secondary, and whereas this fact doubtless contributes largely to the success with which these fixed forms are now maintained, it necessitates, on the other hand, an elaborate system of auxiliary circulatory networks. It is highly probable that the static form of the morphologic elements of the transparent media, an extremely low degree of wastage and therefore also of replacement, possibly predicates here the minimum metabolic rate of the entire normal human economy. Would not such a near balance of the local anabolism and catabolism fit perfectly into the concept of static forms? And is there in that concept anything incongruous with the nature of the required function of these tissues?

It is common clinical experience that opacities of the transparent ocular media yield little, if at all, to such treatment as researches have so far evolved. Nor is this due to any lack of careful investigation of the pathologic and biochemic changes underlying them. Rather, the fact would seem to fit the larger view, more appropriately than any other, the hypothesis of the static form, the finished evolution, in which state all other considerations, even of repair, have been subordinated and forever abandoned to the complete fulfilment of a single function, transmission of light.

AN ATYPICAL PIGMENT LINE OF THE CORNEA

A BIOMICROSCOPIC AND HISTOLOGIC STUDY

BERTHA KLIEN MONCREIFF, M.D.
Assistant Professor of Ophthalmology, Rush Medical College
CHICAGO

Histologic studies supplementing biomicroscopic examination of the eye just prior to its excision, as in the following case, are not commonly reported, although this would seem to be the most desirable method of investigating the pathology of the eye.

REPORT OF CASE

History.—S. M., a man, aged 32, on July 18, 1931, entered the ophthalmic outclinic at Rush Medical College, because of enlargement of the right eye, with loss of its vision. Ten years before, at the age of 22, there had been a penetrating wound of the right eye, followed two days later by an operation which relieved the severe pain in the eye. The injured eye retained fairly good vision for about seven years; then within one year's time its vision failed completely, so that it had been totally blind for the past two years. During the past year there had been a gradually increasing bulging of the upper part of the eyeball. The visual acuity was R.—nil; L.—1.0,-4 and Jaeger 1. Clinical examination of the right eye revealed a large intercalary and ciliary staphyloma of nearly the entire upper half of the anterior segment of the bulb (fig. 1), causing a proptosis downward and outward, with a divergence angle of 20 degrees. The upper half of the cornea was displaced forward by the staphyloma. The vertical curvature of the cornea was diminished in the lower half, and slightly increased in the upper half (fig. 3), and there was a shallow sulcus extending from 10 o'clock to 4 o'clock across the cornea. There were four grayish-white opacities in the pupillary zone of the cornea (fig. 1), and some faint, nonvascularized opacities through almost the entire upper half of the cornea, and along the aforementioned sulcus, which was accompanied by a line of yellowish-brown pigmentation. The iris was atrophic and pale blue-gray, and there was iridodonesis. The anterior chamber was very shallow in the superior nasal quadrant, and its depth in the remainder of its extent varied according to the irregularities of the corneal curvatures. The pupil was fixed and derounded, 3 by 4 mm., and just behind it was a grayish-white mass of indefinite form. There was a faint red reflex from the fundus.

Biomicroscopic Examination of the Right Cornea.—The epithelium was without distinct irregularities. The pigment line was clearly seen to lie anterior to Bowman's membrane (fig. 2). Its upper margin was not sharply defined, but faded out gradually, while its lower margin was relatively well outlined. At its nasal end it divided into three branches, and the most intense pigmentation was just temporal to this point. No pigment granules were discernible, even with high magnification. Just beneath the area of densest pigmentation, a short irregular

From the Department of Ophthalmology, Rush Medical College, University of Chicago.

tear in Bowman's membrane was visible. The anterior third of the stroma was clear, but in the middle and posterior thirds there were white feathery opacities which were densest in the pupillary area and along the sulcus. Numerous folds of Descemet's membrane extended obliquely from about 11 o'clock to 5 o'clock. The endothelium was amorphous, as seen within the posterior reflecting zone. No vessels could be detected in the cornea. The marginal vessel loops at the upper limbus were irregular and in places varicose and formed a somewhat denser network than at other places. There were no hemorrhages.

After enucleation, the bulb was fixed in formaldehyde for thirty-six hours; the entire cornea was excised intact and then divided into two parts by a horizontal section. The upper half contained the pigment line in toto; the lower half, which contained no pigment, was retained for use as a chemical control. Vertical sections

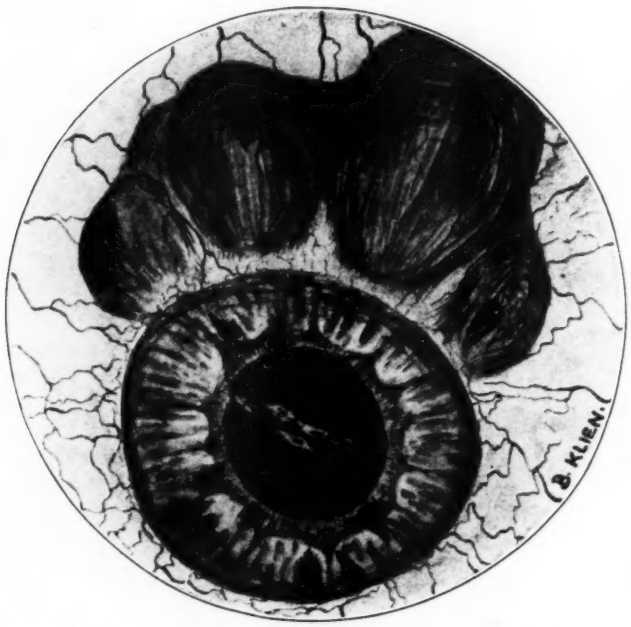

Fig. 1.—Gross view of an eye with staphyloma and pigment line.

were made through the upper half, dividing it into three parts, the largest of which was embedded in paraffin.

Microchemical Examination.—The nature of the pigment was unknown, as the pigment line was neither a Fleischer ring nor a typical Staehli's line. There were three possibilities to be considered: (1) autochthonous uveal pigment, (2) bilirubin and (3) derivatives of the blood pigment.

A chemical test for bilirubin was made by immersing one of the smaller segments of the cornea containing the pigment line in an oxidizing solution consisting of 4 cc. of 96 per cent alcohol and 1 cc. of a mixture of ten parts concentrated nitric acid and ninety parts concentrated hydrochloric acid. Had the pigment consisted of bilirubin, the brown color of the pigment line would have been transformed to green, by the oxidation of bilirubin to biliverdin. Since the original color of the pigment line remained unchanged, the presence of bilirubin was excluded.

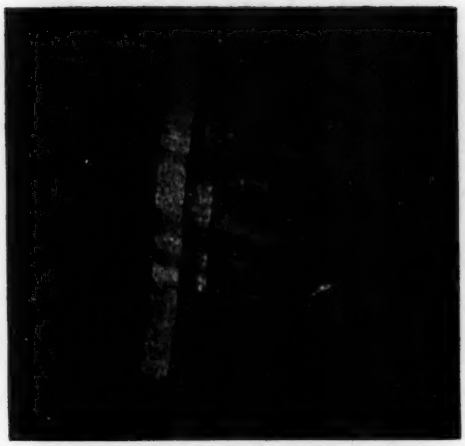

Fig. 2.—Slit-lamp view of the pigment line.

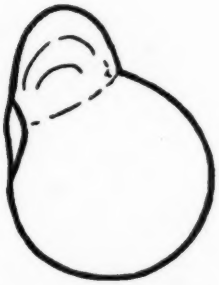

Fig. 3.—Lateral view of the enucleated bulb.

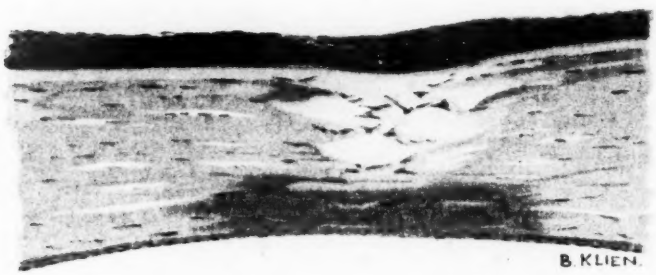

Fig. 4.—Section stained with ferrocyanide.

A chemical test for blood pigment was applied to a portion of the cornea containing the pigment line, and also to another portion free from the pigment, as a control. Each segment of the cornea was immersed for several minutes in a separate container of glacial acetic acid, in order to extract any blood pigment present. After careful filtration through cotton, the benzidine test was applied to each solution. The control solution remained colorless, but the solution containing the extract of the pigment line segment became a beautiful bluish green, thus proving the presence of blood pigment.

Histologic Examination.—That portion of the cornea embedded in paraffin, and containing in its most nasal part the point of ramification of the pigment line, was sectioned vertically from the nasal side temporalward. Serial sections were made, varying in thickness from 3 to 20 microns. Some of them were mounted unstained, some were stained with Delafield's hematoxylin and with eosin, and some with ferrocyanide and alum carmine.

In all the sections there was at one place a sulcus of the cornea. Bowman's membrane was very thin and was sharply defined toward the stroma, in which

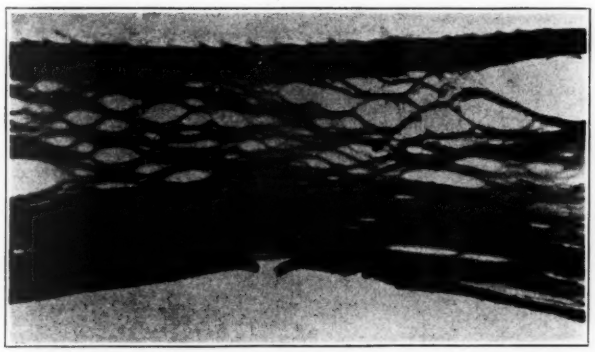

Fig. 5.—Photomicrograph of hematoxylin-eosin section of the cornea.

latter there were numerous artificial clefts. Bowman's membrane was about as thin as Descemet's membrane, which was probably not due alone to fixation in formaldehyde. There were slight irregularities of the corneal epithelium, due perhaps to the secondary glaucoma. Near the corneal sulcus there were small foci of fibrocytes. Within the depressed area, the corneal thickness was reduced to about two thirds of the normal; exact measurements were not possible on account of the shrinkage in fixation. At this place there was a 0.046 mm. break in Bowman's membrane throughout the sections. On one side the membrane was split up into several fibers; on the other it gradually disappeared, losing its sharp limitation on the stroma side. Beneath the dehiscence of Bowman's membrane there was a large nest of fibrocytes. The thickness of the epithelium covering this dehiscence was almost twice the normal.

A rather intense yellowish-brown coloration of the epithelium was visible just above the corneal sulcus, in the (unstained) sections about 20 microns in thickness. No pigment granules could be distinguished, even with the oil immersion lens. A faint brownish tinge could be seen also in the basal cells of the epithelium covering the upper part of the cornea. The stroma was colorless.

The sections immersed in ferrocyanide (fig. 4) showed a deep blue stain in the region above the sulcus which was of brown color in the unstained sections. In

the blue stained areas it was seen that the intercellular spaces were more deeply colored than the cell bodies, especially between the deep epithelial layers. There was a faint bluish stain in the deep layers also throughout the epithelium of the upper half of the cornea, which in some sections was more dense in certain spots, which were probably in the plane of section through the branches of the pigment line. The blue coloration, wherever it occurred, was limited entirely to the epithelium. From the corneal sulcus downward, there was no pigmentation. No vessels were found in the cornea.

It is worthy of note that the posterior third of the cornea, just behind the large mass of fibrocytes, appeared compact, and did not show any artificial clefts like the remainder of the cornea (fig. 5). This compact portion extended from the lower margin of the dehiscence of Bowman's membrane upward and backward.

COMMENT AND CONCLUSIONS

The deep feathery opacities seen with the corneal microscope in the region of the corneal sulcus appeared to be the counterpart of the compactly arranged corneal lamellae of the same region seen histologically. These changes would seem to be related to the altered physical state of this portion of the cornea in consequence of the development of the staphyloma.

It was evident histologically that the pigmentation was far more extensive than could be seen clinically. The distribution of the coloring matter over a wide area of epithelium from the grossly visible pigment line upward to the limbus may indicate the pathway by which it entered the cornea. The distention of the anterior superior segment of the bulb by the staphyloma may have given rise to minute ecchymoses from the marginal vessel loops at some time during the formation of the staphyloma—although no blood extravasates were found biomicroscopically at the time of enucleation, in spite of the irregularities observed—and the varicose appearance of portions of the upper marginal network.

Blood coloring matter in solution (hematin or hemosiderin) seems to have diffused downward from the upper limbus through the deep intercellular spaces of the epithelium, to the upper margin of the dehiscence of Bowman's membrane at the site of the corneal depression, forming the clinically visible pigment line.

Although atypical in origin, the similarity between instances of ring formation in keratoconus and this case of corneal pigmentation combined with a dehiscence in Bowman's membrane may serve to elucidate further the relation between tears in Bowman's membrane and ring pigmentation. Fleischer,[1] in 1922, in his review of modern views on keratoconus, indicated a possible connection between these two pathologic features,

1. Fleischer, B.: Ueber den Hoemosiderinring im Hornhautepithel bei Keratoconus und über den Pigmentring in der Descemetschen Membran bei Pseudosclerose und Wilson'scher Krankheit, Klin. Monatsbl. f. Augenh. **68**:41, 1922.

on the basis of a histologically studied eye. In 1923, Meesmann [2] described a hemosiderin ring in an eye with keratoconus, studied biomicroscopically. There were concentric Bowman tears, and the pigment ring was just peripheral to the outermost tear.

Similar conditions were found by Grueninger,[3] in 1921, in an eye with a pigment line of Staehli. This eye was enucleated post mortem and kept in formaldehyde for several months. In the histologic sections, Grueninger found tears in Bowman's membrane, but no pigment.

It is possible that in the cases of Fleischer's hemosiderin ring and Staehli's line the blood coloring matter comes also from the limbus, as must be assumed for my case, on the basis of the histologically proved continuous if only faint pigmentation of the entire epithelium from the limbus to the grossly visible line. Staehli's theory that the corneal pigmentation is derived from small amounts of alkali-hematin present in the lacrimal fluid does not hold for this case.

---

2. Meesmann, A.: Zur Frage der Entstehung des Fleischer'schen Hoemosiderinringes beim Keratoconus, Klin. Monatsbl. f. Augenh. **70**:740, 1923.

3. Grueninger, W.: Klinische und anatomische Untersuchungen über die Pigmentlinie der Cornea, Ztschr. f. Augenh. **46**:317, 1921.

RETINAL VASCULAR DISEASE IN A CASE OF ACUTE LUPUS ERYTHEMATOSUS DISSEMINATUS

ISADORE GOLDSTEIN, M.D.
AND
DAVID WEXLER, M.D.
NEW YORK

The present case, in which atrophy of both optic nerves occurred in a case of acute lupus erythematosus disseminatus, is reported because it furnishes an instance of unique disease affecting the larger arterioles in the retina.

These lesions were found in the eyes of a young woman, in whom, following a recent illness suggesting acute rheumatic fever, there had appeared a group of bizarre symptoms, including skin lesions resembling those of acute lupus erythematosus disseminatus. No satisfactory diagnosis was arrived at. Among others, an atypical verrucose endocarditis (Libman and Sacks [1]), which is often accompanied by this type of skin lesion, was suggested. A biopsy specimen taken from one of the skin blotches was reported as containing capillary thrombi in the corium, and because of this, a diagnosis of generalized hyaline vascular thrombosis was also offered. Later review of this material failed to confirm this impression of the skin lesion. In spite of the multiplicity of symptoms during life, pathologic studies of all the internal organs, excepting the brain, failed to disclose lesions of any importance, the eyes furnishing the sole source of material where lesions of any consequence could be demonstrated.

REPORT OF A CASE

History.—A. K., an American girl, aged 23, had suffered from whooping cough, scarlet fever and influenza in childhood. Five years before the present examination there appeared symptoms of the joint and other symptoms typical of rheumatic fever. Following a period of good health she began to suffer recurrent fever, occasional jaundice and progressive alopecia. Ten months before admission to the hospital, pains in the joints reappeared, together with soreness of the mouth, red

---

Read before the Section on Ophthalmology of the New York Academy of Medicine, March 18, 1932.

From the Laboratories and Ophthalmological Division of the Mount Sinai Hospital.

1. Libman, E., and Sacks, B.: A Hitherto Undescribed Form of Valvular and Mural Endocarditis, Arch. Int. Med. **33**:701 (June) 1924.

elevated spots on the trunk and extremities, headaches and occasional vomiting. Alopecia was now almost total. At the same time, vision began to grow progressively dimmer.

Physical Examination.—The patient was rather underdeveloped. The mouth showed ulcerated lesions about 1 cm. in size, with red and white borders. The chest was normal. The heart was rapid but not enlarged. There were no murmurs. The right lobe of the liver was palpable. The spleen was enlarged two fingerbreadths below the costal margin, and was very hard and not tender. Neurologic examination gave negative results on admission. The fingers bore a few red maculopapules, 1 cm. in diameter. The scalp was scaly. Over the malar prominences were irregular, pinhead-sized papules and a lacework of erythematous macular blotches. These also appeared from time to time on the elbows, knees and buttocks.

Externally, the eyes were clear. The media were normal. Vision was reduced to perception of light in all fields. The pupils barely reacted to a strong light. In the fundi, both disks were pearly white, with slightly serrated margins. The physiologic cups were slightly veiled. Arteries and veins were extremely narrow,

Fig. 1.—Drawing of the posterior pole of the right eye after death. The white spots correspond to the areas of retinal atrophy (with visible choroid) seen during life.

and some arteries showed perivasculitis. Scattered throughout the fundi, but mainly near the disks, were discrete punched-out areas of atrophy of the retina, bordered by a fringe of pigment, through which the choroid was clearly visible. They occurred only in relation to a vessel, whether artery or vein was not clear, owing to the extreme attenuation of the vessels. The appearance suggested a chorioretinitic lesion. The diagnosis was postneuritic atrophy, and the spots of atrophy were attributed most likely to an old embolic lesion, in the absence of syphilis and tuberculosis.

Course.—Laboratory tests failed to shed any light on the nature of the disease. There were paroxysms of fever to 104 F. Repeated blood cultures were negative. The skin lesions recurred and disappeared. In the final stages there developed bleeding of the gums, vomiting and stiffness of the neck. Numerous other neurologic symptoms appeared, and a catatonic state developed shortly before death.

Autopsy.—No abnormalities were found in the heart, lungs, liver, spleen, kidneys and pancreas on gross and microscopic examination. The brain was not examined.

Both globes, together with 5 mm. of nerve in each eye, were removed ten hours after death. Fixation was done in Bouin's solution and paraffin; staining with

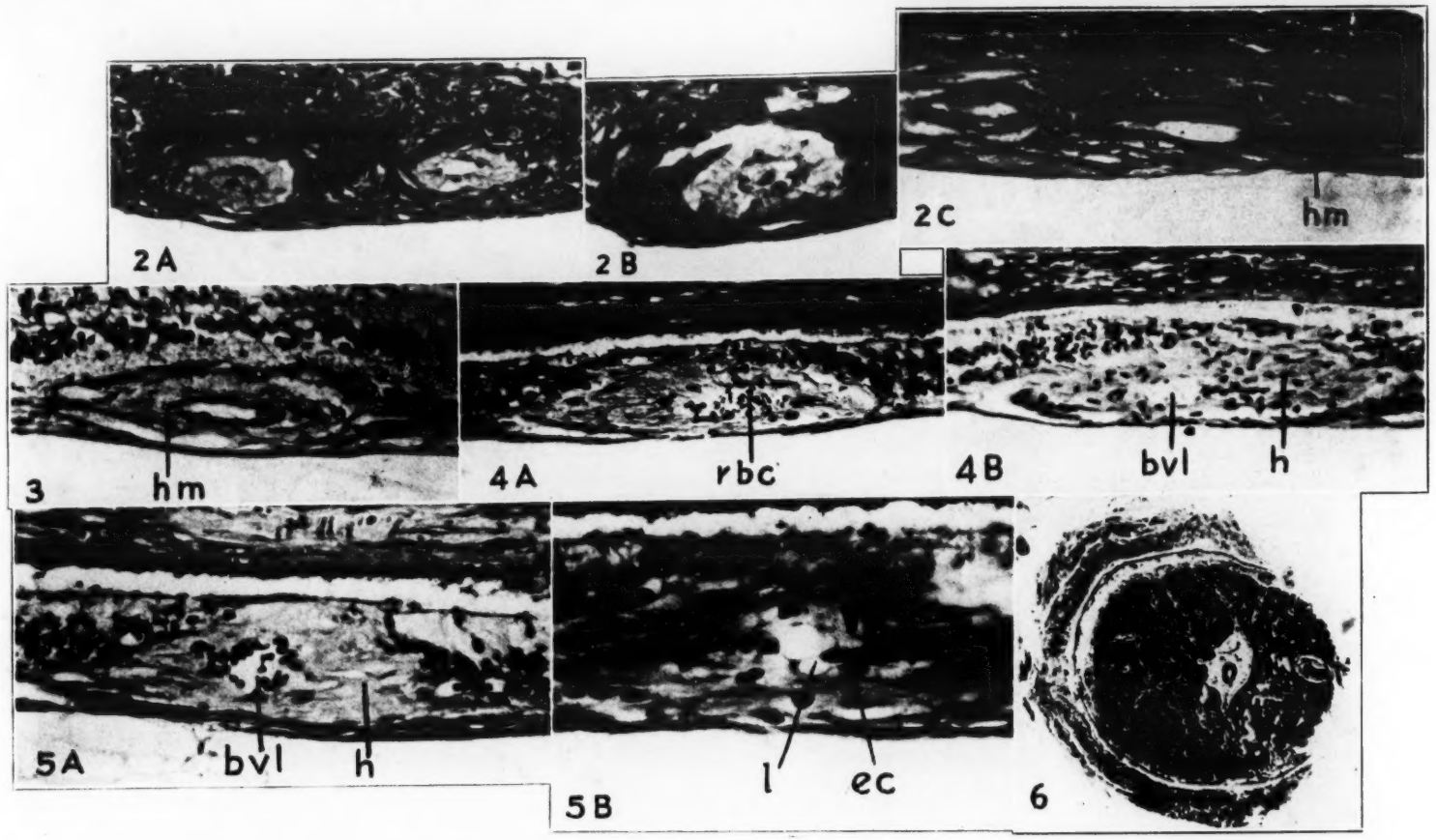

Fig. 2.—Sections of a branch of the retinal artery adjacent the disk. In *A* and *B* the media is foamy acellular and stains poorly. The lumen is shrunk. *C* was taken at a slightly different level; the media consists of fibrillar material resembling hyalin, *hm*.

Fig. 3.—The retinal arteriole near the macula. The media, *hm*, consists of hyaline connective tissue.

Fig. 4.—Sections through the white spot overlying the vessel in figure 1. *A*, shows a group of red blood cells (*r b c*) in a lumen. Merely the endothelium of a previously existing vessel remains. In *B*, taken at a different level, plasma cells infiltrated into a mass of fibrous tissue surrounding a blood vessel lumen, *b v l*.

Fig. 5.—Sections showing complete retinal atrophy about a blood-containing lumen. In *A*, only red blood cells and a few endothelial cells mark the situation of a vessel, *h*; homogeneous fibrous tissue replace the entire retinal wall. In *B*, endothelial cells, *e c*, displaced from the lumen, *l*, mark the site of the former vessel structure. An occasional glia fiber traverses the circumscribed atropic area. Phosphotungstic acid-hematoxylin stain.

Fig. 6.—Section of the optic nerve, the right eye showing atrophy. Kulschitzky's stain.

hematoxylin-eosin, Kulschitzky's stain for medullary sheaths, and Verhoeff's modification of Mallory's phosphotungstic acid-hematoxylin stain for glia.

Microscopic Examination.—There were no abnormalities in the iris, ciliary body or choroid. The blood vessels were entirely normal.

The disk showed a saucer-shaped depression typical of the consecutive form of optic atrophy. There was marked gliosis.

In the retina, the cells of the ganglion cell layer for the most part had disappeared. The entire coat was reduced to slightly more than half its normal width. Figure 1 is a drawing of the right fundus made soon after removal of the globe. The prominent spots overlying the vessels were white (anemia after death) and corresponded to the punched-out areas observed during life. Particular attention was paid to the structure of these and to all the blood vessels in the retina.

Serial study of vessels in different portions of the retina showed disease in all vessels possessing a media. The changes were such that soon after leaving the disk, it was not possible to tell with accuracy whether one dealt with artery or vein. Figure 2 shows sections of the artery at the temporal edge of the disk. The lumen appeared to be constricted, while the media was replaced by an almost acellular, fibrillar material, staining faintly with eosin. In places the fibrillar material appeared more homogeneous. There was no thrombosis. Figure 3 represents a vessel midway between the disk and the macula. Here the intima was separated from the adventitia by a scant, somewhat foamy structure, practically acellular.

Sections through the circumscribed spots of atrophy shows that these are made up of atrophic retina surrounding a diseased or atrophic vessel. In these areas, it was not possible to distinguish artery from vein, since the vessel wall had undergone atrophy. In some sections, as in figure 4, an endothelial layer of cells was present, at least in part. In the other section (fig. 5), only a space containing red blood cells surrounded by a mass of fibrillar material could be made out. In figure 5 *B*, only a few displaced endothelial cells marked the site of a previously existing blood vessel. In some sections, plasma cells had infiltrated into the tissue about the lumen (fig. 4 *B*). The retina itself was replaced either entirely or nearly so by compact fibrous tissue, and the pigment epithelium corresponding to it and adjacent to the fibrotic area was greatly disturbed. Only an occasional glial fiber could be demonstrated in the atrophic mass.

In sections of the atropic nerves, a striking peculiarity was the large number of blood vessels, made all the more prominent by the fact that each was embedded in a meshwork of young loose connective tissue. These vessels as well as the central retinal vessels were normal.

COMMENT

The vascular lesion in this case consisted of atrophy of the walls of the larger arterioles in the retina, with replacement by material resembling hyaline connective tissue. In some places, there was present in addition a perivascular fibrosis, so extensive as to produce discrete areas of retinal atrophy.

This replacement of the layers of the retina in relation to a diseased blood vessel is of exceeding interest. The intima and media could not be recognized as such, but the presence of endothelial cells about the group of blood cells made it fairly certain this was the site of a medium-sized vessel. Also these areas of atrophy were found only about such

a lumen or vestige of a blood vessel. Further, the lesion was strictly retinal and independent of the choroid. The latter was entirely normal, was not adherent to the retina, and there was no pigment in the atrophic areas or its vicinity. In other words, this was not a spot of localized chorioretinitis such as is encountered in septic retinitis or chorioretinitis. That the lesion was embolic in origin is highly improbable, since such lesions depend on the occlusion of terminal retinal arterioles of much smaller size.

The type of retinal vascular lesion in this case is distinctive. What relation, if any, it may have to so-called pariarteritis nodosa it is impossible to tell. However, the latter appears to have predilection more for the walls of the vessels of the choroid,[2] rather than for those of the smaller vessels of the retina.[3] Ophthalmoscopic evidence of lesions in periarteritis nodosa is still lacking, but as yet no case has been reported in which vision has been seriously interfered with as a direct result of this disease. In contrast to this, the case here reported presented almost complete optic atrophy.

ABSTRACT OF DISCUSSION

DR. ISADORE GOLDSTEIN: This case clinically resembled rheumatism, but on microscopic examination Aschoff bodies were not found. Aschoff bodies are large protoplasmic cells that occur in the loose connective tissue and immediately around the blood vessels and stain with the basic dyes. In a case in which the bodies were found to be numerous, we studied the eye and were unable to find Aschoff bodies. In order to make the diagnosis of rheumatic disease of the eye, the identification of Aschoff bodies will be necessary.

Subacute bacterial endocarditis was also considered. The fundus picture and pathologic changes have already been presented by Dr. Wexler. Libman-Sachs' disease (atypical endocarditis) was also considered. Histologic proof of this condition was lacking.

Acute lupus erythematosus disseminata is attracting much attention at present. Probably all these cutaneous lesions in which ocular changes occur are related. In subacute endocarditis and Libman-Sachs' disease there exists a lupus erythematosus-like condition of the face, body and mucous membrane. In acute lupus erythematosus disseminata, there are joint, brain, cardiac and other symptoms, but so far as I know, there is no fundus picture. For the present, we are unable to classify this fundus picture and histologic changes.

DR. ARNOLD KNAPP: Dr. Wexler's remarkable demonstration brings to mind that von Michel described a fundus condition as due to acute periarteritis. If I remember rightly, he associated this condition with sepsis or infection near the eye.

DR. MARTIN COHEN: Have other organs of the body showed the same vascular changes that occurred in the eye?

---

2. Christeller, E.: Arch. f. Verdauungskr. **37**:249, 1926. Goldstein, I., and Wexler, D.: Ocular Pathology of Periarteritis Nodosa, Arch. Ophth. **2**:288 (Sept.) 1929. Friedenwald, J. S., and Rones, B.: Ocular Lesions in Septicemia, ibid. **5**:175 (Feb.) 1931.

3. Böck, J.: Ztschr. f. Augenh. **69**:225 (Oct.) 1929. von Herrenschwand, F.: Klin. Monatsbl. f. Augenh. **83**:419, 1929.

DR. DAVID WEXLER: The vascular lesion consisted of an edema of the intima, causing a spreading apart of the vessel wall, and in some instances a disappearance, due to solution of the rest of the structure, so that only endothelial lining remained. Infiltration with plasma cells then occurred about the remaining lumen, or else a circumscribed area of atrophy of all layers of the retina, including the pigment epithelium. Only the retina was affected without involvement of the choroid. No vascular lesion of any sort could be found in any other organ of the body in spite of the closest examination.

MUSCLE RECESSION WITH TENDON STUMP AND TENON'S CAPSULE FIXATION

WALTER C. MOTT, M.D.
ALBANY, N. Y.

The uncertainty of obtaining the desired result by using simple tenotomy or any of its several modifications in cases of strabismus has caused this type of operation on the extrinsic ocular muscles to be looked on with deserved skepticism. It is probable that the knowledge gained over a period of years from diverse ways of shortening a muscle, as by simple resection, resection and advancement or tucking, suggested the idea of applying more exact measures in dealing with the tenotomized muscle by fixing the tendon at a predetermined point. The notable work of Jameson,[1] corroborated by the experience of many surgeons, not only has established the advisability of combining recession of one muscle with some form of shortening operation to increase the action of the opponens in high degrees of squint, but has proved the practicability of using recession alone in selected cases.

Recession, as practiced today, has become quite an accurate procedure, since the theoretical estimation of the amount of correction to be expected and that actually obtained have been found to correspond closely. It is evident that in working with living tissue of unknown elasticity, contractility and innervation, estimations can be but approximate. Williamson-Noble,[2] quoting Wilkinson, found correction of 4 degrees of squint per millimeter of recession, the theoretical amount being about 4.7 degrees. Jameson [3] noted similar results in dealing with the interni, with but one third of this amount for the externi.

PRESENT TECHNIC

The technic of operation, with which I am here alone concerned, is found to vary according to the selection of tissues deemed most suitable for fixation by the individual surgeon. According to published reports, the conjunctiva, episclera, sclera and tendon stump are used; some alone,

---

From the Department of Ophthalmology, Albany Medical College.

1. Jameson, P. C.: Correction of Squint by Muscle Recession with Scleral Suturing, Arch. Ophth. **51**:421 (Sept.) 1922.

2. Williamson-Noble, F. A.: Graded Squint Operations, Tr. Ophth. Soc. U. Kingdom **49**:155, 1929.

3. Jameson, P. C.: The Surgical Entity of Muscle Recession, Arch. Ophth. **6**:351 (Sept.) 1931.

others in combination. The success of any procedure depends on two factors, namely, accurate placement of the muscle tendon and secure fixation until a new attachment between sclera and tendon has been formed.

Some familiar methods in use today to achieve these results are, in brief, as follows:

Jameson [4] anchors the tendon to the sclera by means of catgut scleral sutures. The principle is sound, since it affords good anchorage and accuracy in placing the tendon. There are, however, certain technical difficulties in doing scleral suturing, particularly for the surgeon doing the occasional operation for squint. There are also some inherent hazards, such as infection in the presence of sutures too deeply placed, perforation of the globe with the needle and pulling out of sutures in tying when they are introduced too superficially.

Agatston [5] devised a modification of the simple control ligature for the tenotomized muscle, using the episclera and stump of the original tendon insertion as points of fixation. Berens and his co-workers,[6] with slight modification of sutures, use a similar technic. Satisfactory results have been reported with either method. Goldenburg [7] reported suturing the muscle tendon to conjunctiva alone. Gorst [8] employs a control ligature through the tendon stump after tenotomy of the internus for correction of convergent strabismus. The ligature is left untied unless overcorrection is evident. If the latter effect is present subsequently, the effect may be slightly graduated by tying the suture about the fifth day. The last two methods are, theoretically at least, not as accurate as either scleral or episcleral stump fixation.

STUMP-TENON'S CAPSULE FIXATION

The method to be described makes use of the tendon stump and Tenon's capsule. The former, as an anchorage point, is ideal, since it offers a strong, natural attachment assuring correct anteroposterior alinement of the muscle secured to it. Consideration of the anatomy and histologic structure of Tenon's capsule, or fasciae bulbi, indicates its suitability as an aid in providing both anteroposterior and lateral

4. Jameson,[3] p. 347.

5. Agatston, S. A.: Muscle Retroplacement in the Correction of Squint, Am. J. Ophth. **7**:361, 1924.

6. Berens, C.; Losey, R. R., and Connolly, P. T.: Retroplacement for Strabismus, Am. J. Ophth. **12**:720, 1929.

7. Goldenburg, M.: Control of the Tenotomized Muscle, Am. J. Ophth. **14**: 648 (July) 1931.

8. Gorst, P. Eldon: Controlled Recession Operation for Treatment of Convergent Strabismus, Lancet **2**:291 (Aug. 9) 1930.

fixation.[9] It is a connective tissue membrane with lamellar structure, relatively firm and varying in thickness, ensheathing the globe except for the cornea. Anteriorly, it is continuous with the conjunctivae bulbi and palpebrarum; posteriorly, it thins out at the entrance of the optic nerve. It is united everywhere with the sclera and tendons of the muscles by delicate reticular tissue. It is projected in tubelike form about the anterior half of each muscle and allows for perforation by tendons through slitlike openings.

During this operation, the lateral attachments of the tendomuscle are necessarily freed to permit unhampered retraction of the muscle after tenotomy. Inherent elasticity causes Tenon's capsule to retract laterally. Since it is fixed anteroposteriorly, wing sutures through the receded tendon and adjacent capsule afford lateral as well as secondary anteroposterior fixation. In addition, the tendon is spread out for a broad attachment to the underlying sclera, and the capsule is restored closely to its former anatomic position. These points are apparent from a study of the accompanying illustrations.

PRINCIPLES OF FIXATION

This procedure is offered because of its simplicity and proved effectiveness. It is based on the following principles:

1. Secure fixation of the muscle tendon to the tendon stump, thereby opposing in the same line of force the retractive tendency and contraction of the tenotomized muscle.

2. Curettage of muscle, tendon and underlying sclera to promote adhesive reaction, thus assisting firm union between tendon and sclera.

3. Lateral, combined with secondary anteroposterior fixation, by means of wing sutures attached to Tenon's capsule.

OPERATION

After the usual preparation for operation, an opening in the conjunctiva, 1.5 cm. in length and at right angles to the muscle, as described by Jameson,[10] is made over the approximate point to which the muscle is to be receded. The posterior lip of conjunctiva is elevated slightly with forceps and undermined. When operating on an internus, it is unnecessary to dissect the conjunctiva about the caruncle. In similar fashion the conjuctiva anteriorly is undermined as far forward as the tendinous insertion of the muscle.

The capsule of Tenon is picked up with tenotomy forceps at the border of the muscle about 5 mm. from the place of insertion. An opening is made just large enough to admit the tip of a strabismus hook. The latter is swept across beneath the muscle and brought out on the opposite side through a similar opening in the capsule.

9. Spalteholz, K. W.: Hand Atlas of Human Anatomy, Philadelphia, J. B. Lippincott Company, 1923, vol. 3, p. 816.

10. Jameson,[3] p. 335.

Leaving the muscle intact in its sheath, the latter is carefully separated at the tendomuscle border on either side, using blunt and cutting dissection. If there is difficulty in defining the lateral limits of the muscle, it is advisable to delay the posterior dissection until after the tenotomy, as the muscle is better seen when reflected from the sclera. A second strabismus hook is introduced close to the first and from the opposite side. Sliding the anterior hook forward as far as the tendon insertion breaks up the underlying trabeculae, thereby permitting easy introduction of Prince's forceps. The latter are clamped 5 mm. from the place of insertion (fig. 1 *A*). The hooks are removed, the tendon is cut, leaving a 1 mm. stump, and residual trabeculae between muscle and sclera are separated.

Placing of Central Suture.—A no. 5 twisted silk suture, double-armed with small curved needles, is passed through the central area of the posterior conjunctival lip,

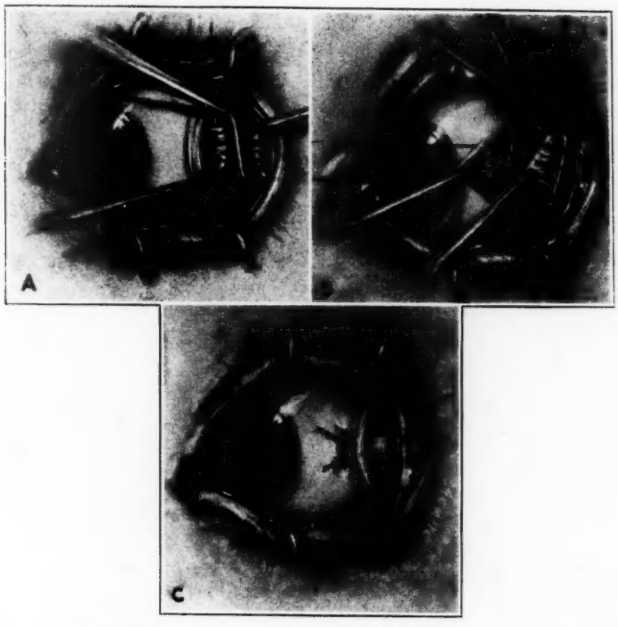

Fig. 1.—*A*, preparation for tenotomy; muscle clamp attached. *B*, detail of central suture; ends brought out through the conjunctiva anterior to tendon stump. *C*, central suture completed; tendon, muscle and apposed sclera previously curetted.

1.5 mm. from the edge and from the outside. While an assistant holds the muscle clamp and a corner of the tendon with forceps, the operator similarly grasps the opposite corner to spread the tendon and to support it for the passage of the needles at the junction of the outer and middle one-thirds and 1 mm. from the free end. The suture is continued through the tendon stump, the needles passing close to the sclera and spaced in the same relative position as in passage through the tendon of the muscle. The suture is completed by bringing it through the conjunctiva which lies immediately over the tendon stump. This point is of importance, otherwise the conjunctival opening cannot be closed properly (fig. 1 *B*). The foregoing step is facilitated by completing one arm of the suture before turning to the second. The needles are removed, the suture ends are tied in a loose single knot and the muscle clamp is detached.

If the opposing muscle is to be advanced or shortened, further work on the muscle being receded is suspended. It will be found that the advancement or shortening process is made easier by the absence of traction of the opposing muscle, owing to its having been freed from the globe. This will be noted particularly when the actual tying of sutures is being done. Returning now to the muscle being receded, the tendon and that portion of muscle which are to lie in contact with the sclera are gently curetted with a sharp curet. The underlying sclera is similarly curetted. Then the suture is tightened until the end of the tendon reaches the point of estimated fixation. If the operation is being done under local anesthesia, the position of the eyes is noted and the desired parallelism, if not already present, is obtained by adjusting the tension of the suture. Under general anesthesia, the gap between the stump and tendon is made to correspond to the amount of estimated recession. The suture is then secured with a square knot (fig. 1 *C*).

Wing Sutures.—Two sutures of no. 3 twisted silk, single-armed with small curved needles, are used for wing sutures. One is introduced from without through the posterior conjunctival flap opposite the muscle border and near the central sutures. After traversing the lateral, anterior corner of the tendon, it is passed

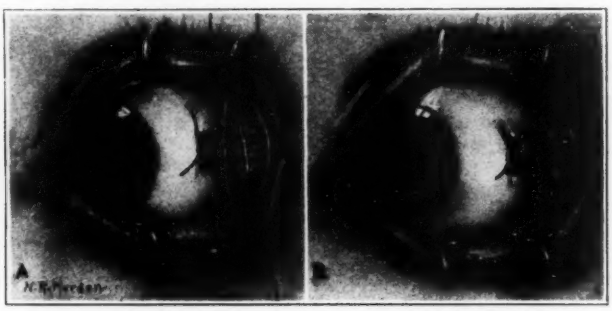

Fig. 2.—*A*, introduction of wing sutures. The central suture is shown relaxed to give detail. *B*, wing sutures tied; central suture knot anterior to tendon stump.

beneath the border of Tenon's capsule immediately adjacent to it. Penetrating the latter, the suture then goes out through the anterior lip of conjunctiva opposite the point of introduction posteriorly. Tenon's capsule retracts laterally to a considerable degree after it has been freed from the attachment along the tendomuscle border, but it can be drawn back readily with forceps to its original position for the passage of the suture. The second wing suture is similarly placed on the opposite side of the central suture (fig. 2 *A*). The tying of the wing sutures closes the conjunctiva and completes the operation. Should any gap remain between the lips of the conjunctiva, owing to its having been opened too widely with the initial incision, additional silk sutures may be used (fig. 2 *B*).

Postoperative Care.—If the strabismus is of the convergent type, atropine is instilled in each eye before applying a binocular bandage. The customary measures are carried out, i. e., rest in bed, use of iced compresses if necessary, to combat the initial reaction, and daily dressing with instillation of atropine if indicated. Sutures should remain for from ten to fourteen days. Removal of the central suture is facilitated by cutting the posterior loop and drawing it out by grasping the knotted end. After two weeks, there is slight elevation of the conjunctiva over the tendon stump and new tendon attachment with a slight depression corresponding to the gap between the two. The whole area tends to become white and flat soon after the removal of sutures.

SUMMARY

The procedure offered as an addition to muscle recession operations now in use employs the tendon stump and Tenon's capsule as structures for reattachment of the muscle tendon. The stump anchorage assures correct anteroposterior alinement of the muscle, while the fasciae bulbi affords secondary anteroposterior attachment with proper lateral fixation. Furthermore, the wing sutures spread out and flatten the tendon, holding it snugly in apposition with the sclera, union with which is promoted by curettage of the apposed surfaces. This technic is safe, easy of execution and effective.

SARCOMA OF THE IRIS

REPORT OF A CASE COMPLICATED BY A CYST

RAYMOND E. MEEK, M.D.
NEW YORK

Sarcoma of the iris is rare. A primary cyst of the iris is also rare, but to find these two conditions together is extremely rare. The following case demonstrates the occurrence of these two conditions in one eye.

REPORT OF A CASE

M. H., a woman, aged 36, was examined first on Feb. 14, 1929, and gave the following history: On Jan. 24, 1929, her husband noticed that the pupil of her right eye was pulled to one side. The eye became inflamed the first week in February. There were pains about the eye at times, and the eye was slightly red. The patient had worn glasses off and on since she was 12 years old, but not in the last three or four years. Vision in the right eye seemed slightly blurred. There were no headaches. Vision was 20/20 in both eyes.

There was no history of tumor in the family or of any other ocular trouble. The patient's general health was good. There was no history of tuberculosis or syphilis. Her father had died of paralysis agitans at the age of 68, and her mother had died of a stroke at the age of 59. The Wassermann and Mantoux reactions were negative.

On examination no sinus tenderness was found. The preauricular glands were not swollen. There were four small verrucae on the upper lid of the right eye and two on the upper lid of the left eye. The margins of the lids were clear. The tension of the right eye was 13 mm., and that of the left eye, 18 mm. (Schiötz). The conjunctivae were mildly inflamed and injected. The pupils were fairly equal and reacted actively to direct and indirect light consensually, and in accommodation. The right pupil was pear-shaped; the apex was pointing to 9 o'clock on the temporal side, at which point there was a slight injection of the episclera. The iris at this point appeared darker than in any other area, i.e., a slate color. The central color vision, the fields and the blind spots were normal.

The right eye showed a small brownish area at the limbus, which seemed a little more densely pigmented than the remaining area. The lens and media were clear. Nothing was seen back of the iris with the pupil dilated. The disk was pink. There was a physiologic cup. The margins were distinct. The vessels were well filled and straight. The macula was slightly mottled. The fundus was otherwise normal. The left eye was normal.

On February 14, with the slit-lamp, a brown nevus was seen in the iris near the limbus at the contracted point of the iris. Here the iris seemed thinned, and was darker than elsewhere. No nodules were seen, and there were no inflammatory cells in the anterior chamber. There were no deposits on Descemet's membrane or on the anterior surface of the lens.

On February 24, there was a small gray elevation in the center of the iris, where it was contracted, with many new vessels that had not been seen before.

Peripheral to this gray area were two rents in the iris, one above and one below. There appeared to be two small anterior synechiae. The rest of the chamber appeared the same as before.

At this time a diagnosis of sarcoma of the iris was made, and the patient was referred to Dr. John M. Wheeler, who made a diagnosis of melanosarcoma. Dr. Wheeler suggested that the patient be referred to Dr. M. Uribe Troncoso for examination with the gonioscope. Dr. Troncoso made the following observations:

"1: With the bio-microscope the outer part of the iris of the right eye appears contracted, the pupil having an oval shape and being displaced and drawn toward this side. In the surface of the iris there is a small mass of a grayish white color about the size of a pinhead, which is covered with two or three vascular loops. Above this mass there is a linear bluish patch of atrophy of the iris, which looks like a rent, still having some horizontal strands of tissue across its depth. In the upper and inner part of this patch the tissue of the iris appears also to be atrophic. In the lower part of the white spot another vertical pseudo-rent is visible, about half the size of the upper one and of the same character. The rest of the iris is normal.

"II: Using a +20 lens, and especially under mydriases the orbiculus ciliaris is visible, showing parallel whitish round spots, which probably correspond to the ciliary processes. Compressing the sclera with the finger outside of the eye over the ciliary region, the black tips of the processes appear still more visible.

"III: By trans-illumination a black spot is detected at the outer part of the pupil, at the place of the growth.

"IV: With the gonioscope a very interesting picture is displayed. In the temporal part of the angle of the anterior chamber the iris is pushed forward and drawn to the outer side of the limbus. The apex of this protrusion resembles a white capped mountain, with a red coloration spread in some places especially at the base. Below the white cap appears a bluish line with white indentations, due to atrophy of the tissue. The sides of the mountain gradually slope, the lower one ending in another fold of the iris, and the upper one joining a smaller protrusion, which has the same characters and color of the former. The iris looks like a curtain spread over two elevations, and hanging loose in between.

"The angle of the anterior chamber is closed in front of the white caps, by anterior synechia. This diagnosis is established by the disappearance of the brown band of the ciliary body, which remains visible below and above, and in fact all around the limbus.

"The drawing forward of the iris affords the opportunity to observe the orbiculus ciliaris, which appears of a black color, mottled with whitish, irregular streaks and red spots, under certain angles of the instrument. The ora-serrata which is geometrically uniform in normal eyes appears here as a straight irregular line. Beyond the black surface a streak of red fundus is visible and further away the edge and surface of the lens, which has a red violet color.

"*Conclusions:* It is probable that a growth is present in the temporal part of the ciliary body which pushes the iris forward on two places and is adherent to its tissue producing the displacement of the pupil toward the temporal side. This growth is vascular, and in my third examination appeared to be more so than in the first. This growth, however, is not a considerable mass, but probably a flat infiltration of the posterior part of the iris.

"The peripheral synechia is not the cause of the drawing of the pupil toward the temporal side, but the infiltration and contraction of the tissue of the iris by the growth.

"The nature of the growth cannot be ascertained with the objective symptoms alone, and a general systemic examination is important. However, the fact that the Wassermann is negative, narrows the choice to tuberculosis, or a sarcoma of the ciliary body."

The patient desired to have the opinion of Dr. William H. Wilmer of Baltimore, to whom she was referred. After examination, Dr. Wilmer reported:

"I find a very definite black mass in the temporal side of the ciliary body of the right eye. This mass seems to be splitting the anterior layer of the iris away from the uveal layer.

"While there is a most remote possibility that this condition may be inflammatory with a cystic formation, it is only in the range of possibility and not probability. In all probability, there is a melanosarcoma, starting in the ciliary body and the splitting of the tissue of the iris layers is due to this growth.

"The safest thing in such a case, of course, is to do an enucleation as soon as it is convenient. It is so small that matters will not have to be rushed."

About two weeks later I removed this eye at the New York Eye and Ear Infirmary, and it was immediately sent to the Eno Laboratory for preservation and sectioning by Mr. E. B. Burchell.

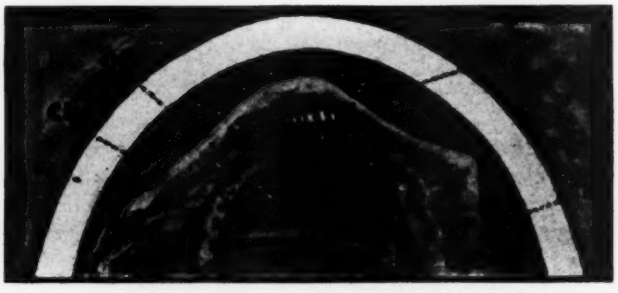

Fig. 1.—The angle of the anterior chamber as it appeared with the gonioscope. The upper part corresponds to the temporal side. *C* indicates the cornea; *CB*, the ciliary body; *I-I*, the iris. The pupil is dilated. *R* indicates the rent in the iris below the apex of the growth. The iris is separated from the lens (*L*) by the growth and allows the orbiculus ciliaris (*OC*) to be observed in a great extent up to the ora serrata. On account of the position of the instrument, the white band of sclera normally seen above the brown band of the ciliary body (*CB*) is not visible in the picture.

Dr. James Ewing, pathologist of Cornell University, made a diagnosis of:

"Possibly early ring sarcoma of the iris."

Another slide was sent to Dr. Frederick H. Verhoeff of the Massachusetts Eye and Ear Infirmary, who made the following comment:

"The tumor in the root of the iris I think is a beginning of melanotic sarcoma. In the one section that you sent there is nothing to show that it is a ring sarcoma. The iris, in addition, shows a number of melanomata (nevi)."

Dr. Bernard Samuels reported the following findings:

"The temporal side of the iris is of shorter radius than the nasal side caused by traction from condensed tissue in the ciliary zone of the iris.

"The angle of the anterior chamber on this side is triangular instead of rounded, while the normal sharp angle between the root of the iris and the ciliary body is rounded. The iris in this neighborhood has evidently been against the cornea, being now separated by an artefact. The contact does not appear to include the

extreme periphery. The pupillary margin on this side reveals a beginning pathological ectropion of the uvea. In the pupillary zone the stroma of the iris is much thinner and more rarefied than that of the opposite side. The condensed tissue referred to is very cellular and contains many convoluted blood vessels. Into the above cellular structure, the anterior limiting layer of the iris is thrown into folds. The densely packed cells of the mass are quite similar to those of the adjoining structure. The growth is confined between the lesser arterial circle on the one side and the root of the iris externally. The uveal portion of the ligamentum pectinatum is more heavy and the cellular tissue stops rather abruptly at the root of the iris. In general the process does not appear to be an infiltrating one. From the greatly thickened anterior limiting layer there springs forward a small mass after the fashion of a papilloma. This globular formation is composed of the same elements mentioned, namely, spindle shaped cells, containing pigment. The mass has pushed against Descemet's membrane destroying the endothelium and causing

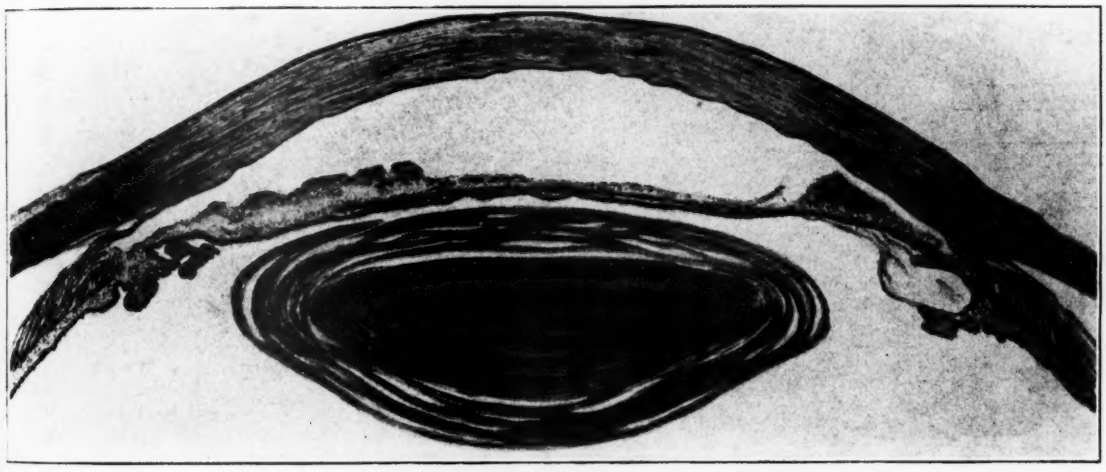

Fig. 2.—Section showing the sarcoma and primary cyst.

a reaction in the overlying cornea in the way of a thin layer of newly formed tissue just anterior to Descemet's membrane.

"The pigmented epithelium under the growth and adjacent thereto is thinner than normal and has lost its markings. The dilator muscle is preserved. The thinning and smoothness of the pigmented epithelium are caused by a large cyst which springs from the ciliary body. The wall of the cyst is composed of a layer of elongated epithelial cells which are continuous with similar cells lining the bays of the ciliary body. The contents appear to be albuminous, a little more dense than fluids of other portions. The cyst extends toward the pupillary margin to a point well under the sphincter muscle. It has caused a notable pressure atrophy of the circular bundles of the ciliary body. The opposite side of the iris reveals a naevus (apparently the tumor took its origin from a naevus or a location of a naevus).

"Inflammatory changes: In the immediate neighborhood of the iris there is practically no reaction but slightly farther back in the vascular layer of the ciliary body a small focus of lymphocytes is made out in some sections. The adjoining tissue of the ciliary body is very edematous. It is of interest to note the well developed spaces of von Blessig at the ora serrata on this side. In all other respects the sections appear normal.

"*Diagnosis:* 1. Sarcoma of iris (beginning)?
2. Deep keratitis
3. Cyst of ciliary body
4. Naevus of iris
5. Uveitis ? mild."

A slide was sent to Dr. W. H. Wilmer at Johns Hopkins Hospital. Dr. Wilmer asked Dr. Jonas Friedenwald, pathologist, to examine the section, and he made the following report:

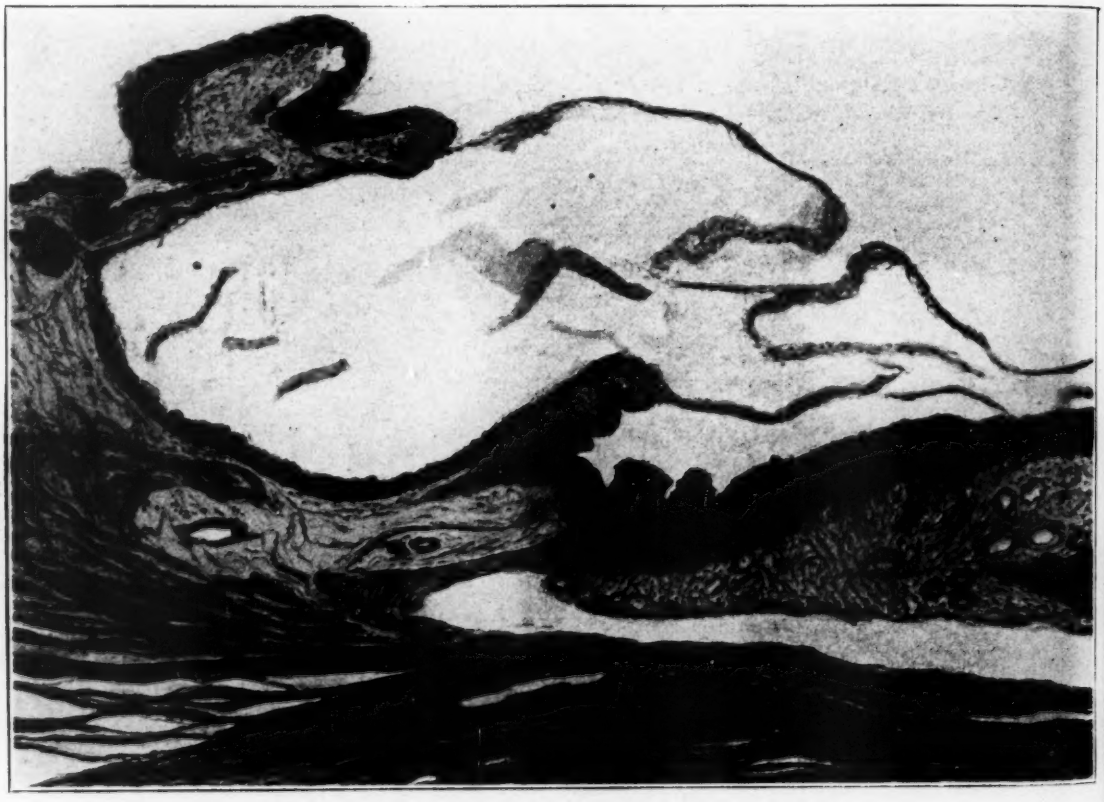

Fig. 3.—Section showing details of the cyst of the iris.

"Evidently it has been taken just off the edge of the tumor which was noted clinically. At any rate, there is no tumor in the section. At one point in the iris near its root, there are some masses of cells and pigment which might be an extension of a melanosarcoma of the ciliary body, but these cell accumulations are hardly sufficient to establish a diagnosis. In this region, the iris is adherent to the cornea but elsewhere, it appears normal. The ciliary body is oedematous and there is senile cystic degeneration of the retina. Otherwise the section shows no lesion."

In Vienna in 1931, Prof. Adelbert Fuchs consented to report his observations on the slide, which follow:

"1. On the temporal side of the cornea are deep vessels and the endothelium is partly wanting where the iris was lying against the cornea.

"2. The anterior limiting layer of the iris on the opposite side shows naevi shaped accumulations of cells with dense inter-cellular varnish stained tissue.

"3. At the place of the peripheral anterior synechia there exist:

"(*a*) A regular root.

"(*b*) A marked atrophy of the pupillary portion of the anterior limiting layer. The sphincter is normal.

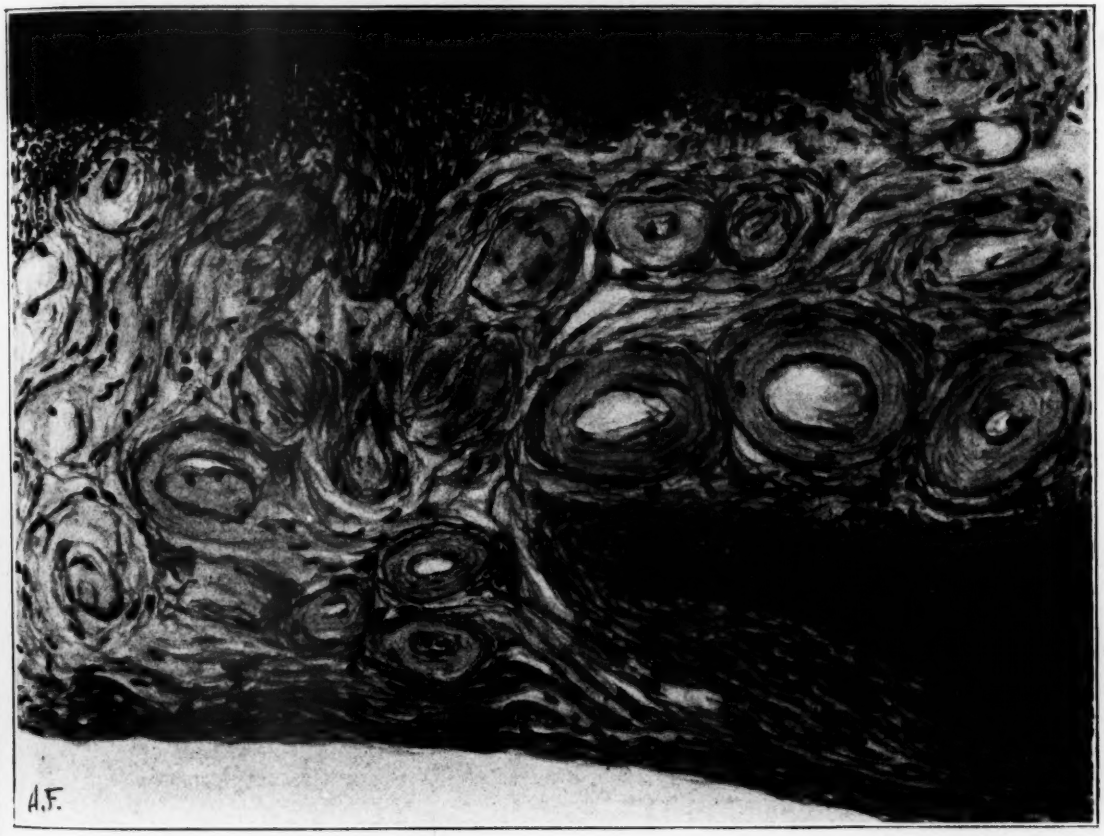

Fig. 4.—Section showing details of the sarcoma.

"(*c*) In the region of the synechia, the iris shows a very dense partly pigmented tissue which does not differ in any principal point from the denser parts of the anterior limiting layer of the other side only it is much more substantial.

"(*d*) All the cells have regular small nuclei in this area, the cells are poor in protoplasm, are especially marked by abundant inter-cellular substance; so as a matter of fact I cannot see any evidence of atypical cells. This hypertrophic portion is divided in two parts by a crypt.

"(*e*) Apparently where the vessels appear on the anterior surface of the iris in the central portion of the hypertrophic area there is a fine granulated brownish mass similar to the naevi on the other side. One vessel in the hypertrophic area

is packed with lymphocytes between adventitia and endothelium so that the lumen appears obliterated.

"4. Behind the iris there is a collapsed vesicle lying on the posterior surface of the iris occupying the medial third of the iris. The cyst apparently occupied a large portion of the posterior chamber pressing the iris against the cornea.

"5. The lens shows fine cataractous changes at the equator and they are more marked on the opposite side. The epithelium is intact.

"6. The surface of the ciliary processes and of the corona ciliaris do not show in the common stained slide a non-pigmented epithelial layer which has to be considered as a congenital anomaly if really a depigmented slide proves this fact.

"*Résumé:* There is no doubt but that the epithelial cyst was the cause of the protrusion of the iris and there is only the question as to whether the adherent part of the iris to the cornea is a malignant growth or a hypertrophy of normal iris stroma. I cannot find any sure and striking evidence of malignancy, as large protoplasm, large nuclei, atypical cells, destruction of the cornea, invasion of the neighborhood, etc. On the contrary, I miss the symptoms we regularly find in cases of sarcoma of the iris; as, dissemination of sarcoma cells to the cornea, to the lens, to the iris, and especially to the filtration angle where no single abnormal cell is present, and no glaucoma was therefore present. The changes in the iris in the adherent area can just as well be interpreted as a hypertrophic area; either due to the pressure of a cyst against the cornea or due to a special stimulus of the atypical epithelial cells on the posterior surface which had perhaps a stimulating power, or finally there was a density through here from the beginning, as a congenital anomaly.

"Therefore, I consider the case as an epithelial cyst of the pigment epithelium of the iris with hypertrophy of the neighboring iris. It would be difficult to imagine that such a rare disease as a spontaneous epithelial cyst, which is without doubt present, should be combined with a similarly rare condition like atypical sarcoma."

CONCLUSIONS

Given a similar case, now, in the light of these findings, how would one diagnose such a condition? Also, if a diagnosis of cyst of the iris were made, with the iris pressed against the cornea, what would one advise one's patient? These are the practical aspects of this case, and these questions were asked by Dr. Wheeler when the findings were presented at the Presbyterian Hospital.

Given a similar condition in a patient, in the light of this experience, the same diagnosis should be made and an enucleation of the eye should be advised. The conservative treatment of a condition of this sort is enucleation, because with the irritation and synechia, resultant glaucoma and degeneration of the eye are natural consequences.

A diagnosis of cyst of the iris would be made only with great difficulty with the known clinical symptoms, and a surgeon would be justified in removing such an eye rather than taking a chance of losing a life.

The patient was last seen on July 2, 1931, at which time she was in perfect health and the left eye was normal.

VENOUS ANGIOMA OF THE RETINA, OPTIC NERVE, CHIASM AND BRAIN

A CASE REPORT WITH POSTMORTEM OBSERVATIONS

ERNEST F. KRUG, M.D.
AND
BERNARD SAMUELS, M.D.
NEW YORK

In the literature we find many references to anomalies of the retinal circulation—abnormal tortuousness and unusual communicating branches between two different vascular areas. Such vascular anomalies, particularly when unilateral and associated with exophthalmos, indicate that the retinal lesion is only a part of similar vascular malformations of the central nervous system, especially of the brain.

The case presented here for record of the unusual ocular findings was first seen by one of us (Dr. Krug) in the fall of 1931.

REPORT OF A CASE

History.—S. F., a man, aged 21, complained of defective speech, unsteadiness in gait, noise in the right ear of seven years' duration, restlessness, fatigability, depression with suicidal trends and mental deterioration. The patient was the only child of healthy parents. There was a history of instrumental birth, and the mother stated that at the time of birth the right cornea was imperfect. A few days after birth a peculiar mottling of the skin of the right side of the face was noted. His mental development seemed normal, but physically he had never been strong. As a child he had severe and prolonged bleeding from his gums when a dentist lanced them to hasten the eruption of the right molar teeth, and again following a tonsillectomy he had severe hemorrhage due to the involvement of the mucous membrane of the right soft palate and tonsillar fossa by the angiomatous lesion.

In October, 1925, he had had what was believed to be an attack of acute epidemic encephalitis, in which he slept continuously for six weeks, followed by a month of delirium. The right upper and lower extremities became paralyzed, and speech became impaired.

We quote the following from a description of this patient given in a separate paper entitled, "Venous and Arteriovenous Angiomas of the Brain," by Drs. Samuel Brock and Cornelius G. Dyke, to be reported in the *Bulletin of the New York Neurological Institute:*

"Patient walks with an ataxic gait. On the right side of the face and temple a raised soft, angiomatous lesion is seen. The right ear pulsates synchronously with the marked throbbing of the right temporal and right carotid arteries. Over the temporal region a loud systolic bruit is heard which can be followed into the adjacent neck. It is not heard over the rest of the head. When

Read before the American Ophthalmological Society, New London, Conn., June 27, 1932.

the carotid arteries are compressed with the fingers, the bruit can no longer be heard, and at the same time the tinnitus of which the patient complains disappears. When the pressure is removed, both bruit and tinnitus reappear.

"While the facial innervation is normal on voluntary action, a definite left mimetic weakness is noted. Speech is slowed and somewhat scanning.

"The motor, reflex, and sensory status is normal. There are no heart murmurs. An *x*-ray examination showed that the heart was not enlarged. The pulse rate is 86; blood pressure, 110/80. He is right-handed. The patient is intellectually deteriorated and is depressed.

"The roentgenograms of the skull show two unusually large vascular channels in the right frontal bone which course in a vertical direction. The right middle meningeal channel proceeds upward along the coronal suture for a distance of 3 cm., and then takes a sharp turn anteriorly to disappear in the large vascular channels previously described. There is no abnormal calcification.

Fig. 1.—Photograph of fundus at disk, showing tangle of enlarged tortuous veins.

"The electrocardiogram was normal."

Examination.—Ophthalmologic examination revealed the right eyeball proptosed slightly forward, downward and outward, and its movements were limited inward and outward, suggesting retrobulbar extension of the process. The eyelids were thickened, and the conjunctival vessels were full. The right pupil was semidilated and fixed, and consensual pupillary reaction was absent, showing a definite involvement of the optic nerve. The media were clear except for a small macula at the lower limbus at 7 o'clock, which was most probably the result of trauma from instrumentation at birth. The eye was blind.

Ophthalmoscopic examination of the right fundus presented an unsual picture (fig. 1). The veins were so greatly engorged and tortuous that the disk was almost completely obscured. Where visible, there was no elevation of the disk. The vessels showed much thickening, indicative of a prolonged, progressive process. Where distinguishable, the arteries were not enlarged, and at no point was there any visible communication between the vessels. There was no pulsation of the vessels. Some migration of pigment along the vessels was evident (fig. 2).

The veins of the left fundus were full, but not tortuous. With correction, —1.00 sph. ⌒ —0.75 cyl. ax. 180°, the vision of the left eye was normal (6/6 and Jaeger 1), and the field was normal for form and colors.

On March 18, 1932, the patient committed suicide by strangulation. The right eye, orbital contents and the brain were removed on March 20. The pathologic findings of the brain will be reported in Brock and Dyke's paper, previously cited.

At autopsy an angiomatous lesion was found extending from the right retina along the right optic nerve, chiasm and tract to the right of the midbrain and via the right superior cerebellar peduncle to the right of the cerebellum (dentate nucleus), which explained the entire symptomatology.

Comment.—Tumors of the blood vessels are of two distinct major types: angiomatous malformations and hemangioblastomas or true neoplasms of the blood vessel elements. The angiomatous malformations

Fig. 2.—Drawing of nerve head and surrounding retina, showing migration of pigment cells along walls of vessels.

are undoubtedly the result of some fault of development, and may be distinguished clearly from true tumors of the blood vessels by the presence of traces of compressed nerve tissue between the vascular loops comprising the lesion.

Our case is one of congenital angiomatous malformation.

Through the studies of Florence R. Sabin [1] we have acquired a better understanding of the manner of development of the blood vessels from the primordial endothelial blood-containing channels. These spaces are neither arteries nor veins, but constitute the source from which these vessels are derived. It is not difficult to understand how malformations within certain vascular areas can occur, as the metamorphosis of primor-

1. Sabin, F. R.: Anat. Rec. **13**:199, 1917.

dial endothelial blood-containing channels into differentiated blood vessels takes place. It is evident that the retention of the original vascular connections between arteries and veins will readily explain the origin of the adult arteriovenous aneurysms. The maldevelopment of the original vascular bed would similarly explain the nests of abnormal vessels which are interposed between the arteries and veins and which replace the normal capillary bed.

These vascular malformations are of three distinct types: (*a*) telangiectases or capillary formations (cavernomas); (*b*) venous angiomas (entirely venous), and (*c*) arterial or arteriovenous angiomas.

We are concerned with the second group—the venous angiomas—of which there are the following distinct anatomic varieties: (1) the simple varices; (2) the serpentine, referring to a single, much enlarged vascular channel; this at times is associated with (3) a small racemose variety, forming a mass of interwoven, at times pulsating, blood vessels.

Where the brain is involved, the racemose type either courses on the surface of the brain or extends beneath the cortex in a wedge-shaped manner, like an inverted cone with its apex toward the ventricle, in which a terminal hemorrhage not infrequently occurs.

In general, the venous system is not so regular in arrangement as the arterial, hence variations in it are much more frequent. When a newly formed blood sac furnishes communication between artery and vein, a varicose aneurysm is formed, but when the blood from an artery is forced directly into a vein which yields from pressure of the arterial blood, an aneurysmal varix follows. Without any weakening of its force the arterial blood passes directly into the vein, and it is not surprising that the vein becomes tortuous and distended. The force of the blood current also explains the great tortuosity of the smaller venous branches which give rise to the tangle of vascular loops. These branches, designed to carry back venous blood from the capillaries to the heart, now convey arterial blood to the heart.

The pallor of the blood in the varix is due in part to the mixture of arterial and venous blood and in part to the great thickening of the vessel wall. The vein takes on a darker color the nearer it approaches the disk, as more venous blood is added to the mixture.

Virchow's [2] classic, "Die krankhaften Geschwülste," published in 1863, gives a bibliography of the subject of angiomatous tumors in general prior to that date, with an admirable account of the effort to come to some determination as to the nature and proper classification of these lesions. Little was added to our knowledge until Lindau's [3] paper,

2. Virchow: Die krankhaften Geschwülste, Berlin, A. Hirschwald, 1863.

3. Lindau, A.: Acta path. et microbiol. Scandinav., supp. 1, 1926, p. 1.

in 1926, followed two years later by the monograph of Cushing and Bailey,[4] and by Dandy's [5] paper in the same year.

Cushing and Bailey's contribution continues Virchow's review of angiomatous tumors, as it is a survey from 1863 to 1928, with a bibliography of 261 references covering this period. These investigators divide tumors of the cerebral blood vessels into two large groups: the hemangioblastomas and the vascular malformations. The former, which are true neoplasms and, as shown by Lindau, are usually cystic, have their favorite seat in the cerebellum and in other parts of the central nervous system, such as the brain stem and the spinal cord. These growths are apt to be associated with benign, simple multiple cysts of the pancreas and kidney. Hypernephroma or suprarenal adenoma may coexist.

Of the vascular malformations, Cushing and Bailey pointed out that it is most important to distinguish between a superficial variety, which is found on the surface of the brain, and a deep form, which extends into the cerebral substance in a wedge-shaped manner.

Dandy devotes his entire paper to the latter more frequent and more important group. The presence of a bruit in this group is indicative of the arterial participation in the malformation. The difficulties encountered in distinguishing the venous from the arteriovenous formations, the nature of the histologic changes, and whether arteriovenous angiomas are venous lesions which later become arterialized are questions that have been thoroughly discussed by Cushing and Bailey and others.

Cushing and Bailey also stated that the presence of an interstitium of gliosed brain tissue between the abnormal blood vessels is evidence of the essential non-neoplastic nature of the process.

In our case the presence of the enlarged, throbbing right carotid and temporal arteries, with the systolic bruit, indicates an arterial component entering into the vascular complex. In all probability the angioma was undergoing a process of arterialization before becoming an arteriovenous angioma.

The absence of choked disk, we believe, shows definitely that the venous element was the predominating one, as choked disk rarely accompanies venous angiomas, although there may be exceptions to this rule.

The tinnitus in the right ear was due to the auditory perception of the systolic bruit in the adjacent enlarged temporal artery.

---

4. Cushing, Harvey, and Bailey, Percival: Tumors Arising from the Blood Vessels of the Brain, Springfield, Ill., Charles C. Thomas, 1928.

5. Dandy, W. E.: Arteriovenous Aneurysm of the Brain, Arch. Surg. **17:** 190 (Aug.) 1928.

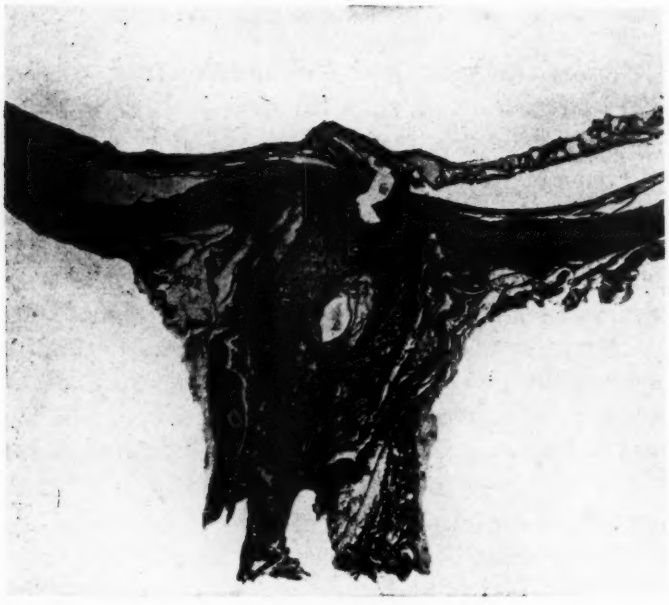

Fig. 3.—Enlarged and dilated central blood vessels in nerve and retina. Cystic degeneration of retina.

Fig. 4.—Cross-section of nerve near optic foramen, showing stem of nerve to be composed almost entirely of blood vessels. Orbital vessels are larger than normal.

The presence of vessel abnormalities in the retina always demands a careful study of the visual field. Unless associated with trigeminal nevi, venous angiomas are more often overlooked than when an arterial component enters into the picture, with the development of an audible bruit.

Histopathology (Samuels).—Tracing the structures of the eyeball backward, the cornea and sclera were found to be normal. There was nothing remarkable about the iris or the ciliary body. The angle of the anterior chamber was free and normal.

The retina showed an unusually well developed system of blood vessels anteriorly back of the ora serrata. The retinal blood vessels in this region were larger than normal.

Fig. 5.—Islands of "foam" cells here and there.

In the posterior segment the vessels attained so great a size and became so tortuous that they occupied more or less the entire thickness of the retina—they touched at points the pigment epithelium or the lamina vitrea of the choroid. They protruded far into the vitreous cavity. Between the walls of the blood vessels the attenuated retinal tissue was in a high state of cystic degeneration (fig. 3), and here and there the pigment epithelium had propagated into the stroma.

The choroid showed nothing remarkable except some condensation under the vascular growth.

At the entrance of the optic nerve many large, thin-walled vessels were found distended with blood. Most of them had the structure of veins rather than that of arteries. The central vessels as they passed through the cribriform fascia were unusually large (fig. 4). Posterior to the fascia they were accompanied by so many other vessels that the stem of the nerve appeared to be converted into a tangle of blood channels lined by endothelial cells and having mostly thin, atypical walls, similar to cavernous tissue. Occasionally a few vessels showed a more fully developed stage. In general, the blood spaces bore the characteristics of sinuses.

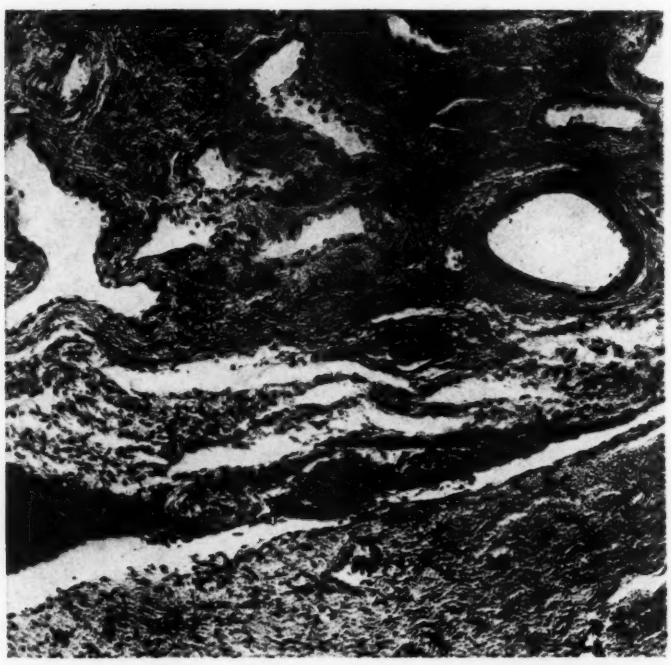

Fig. 6.—Detail of blood vessels and interstitial tissue.

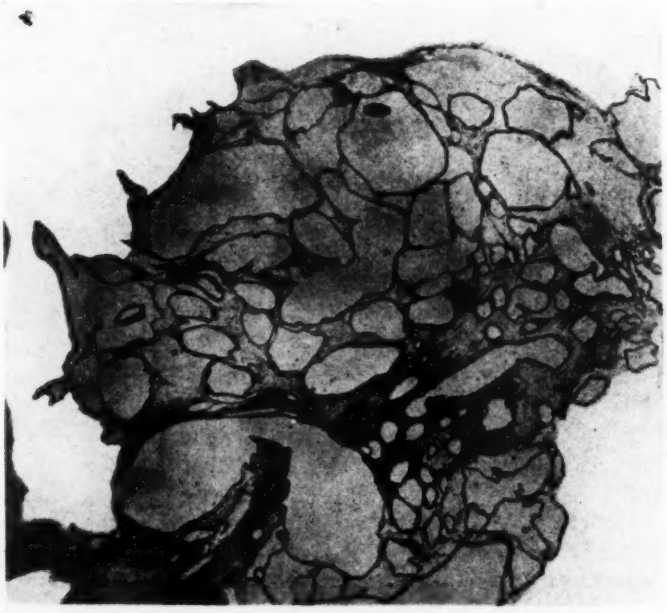

Fig. 7.—Large vascular channels in optic chiasm.

Between the vascular structures there was a regular septum system of the nerve, interspersed with islands of glia cells, among which were a few naked axis-cylinders. Aggregations of cells resembling "foam cells" were present at many points (fig. 5). No myelin could be seen throughout the length of the nerve. The vascular spaces grew larger as the nerve approached the brain. The diameter of the orbital division of the nerve was not increased in the sections, although in life, when the spaces were filled with blood, there must have been some increase in caliber over the normal. The intervaginal space revealed many typical psammomas. In the orbital tissues surrounding the optic nerve there were many blood vessels of larger caliber than are commonly seen (fig. 6).

In the optic chiasm a still more unusual picture was noted. Here the vascular channels were exceedingly large (fig. 7). Some of them, by communicating, gave rise to large vascular labyrinths. Deep in the substance of the chiasm the vessels were surrounded by a fairly dense glial network. In one area of the chiasm the glial tissue appeared to be more dense, and gave the impression that the nerve fibers were here preserved; on careful examination, however, no fibers could be detected.

Diagnosis.—The diagnosis was venous angioma of the retina, optic nerve, chiasm and brain.

EXPERIMENTAL CATARACT IN VITAMIN G DEFICIENCY

C. S. O'BRIEN, M.D.
IOWA CITY

Cataracts develop frequently in young rats fed on a diet deficient in vitamin G. In addition to the opacities of the lens, other pathologic changes occur in the eyeballs and lids.

In the present unsatisfactory state of knowledge regarding vitamins, it is known that water-soluble vitamin B, such as is found in yeast, rice, wheat, fresh meats, green leaves, etc., is a complex vitamin and is made up of two or possibly three factors. One factor of this B complex is the vitamin known as B, F or B_1; this is antineuritic, comparatively thermolabile and soluble in alcohol. The other well known factor is vitamin G or B_2; this is pellagra preventive, comparatively thermostabile and almost insoluble in alcohol. A third factor, vitamin B_3, is apparently necessary for the maintenance of growth.

Young rats deprived of vitamin G fail to gain in weight and, after a few weeks, show pathologic changes in the eyes, skin and internal organs. Many of the rats die as a result of changes in the gastro-intestinal and genito-urinary tracts.

In the literature on vitamin G deficiency ocular changes have been reported frequently, e. g., loss of hair from the region of the eyes, conjunctivitis with a sanguinopurulent secretion and keratitis. However, prior to our article published in 1931,[1] it is only in the publication of Salmon, Hays and Guerrant [2] in 1928 that opacities of the lens have been mentioned; they believed that the opacity centered in the vitreous humor, but sometimes affected the crystalline lens. In 1931, we were able to prove that the deep-seated opacities were always due to cataractous changes in the crystalline lens.

EXPERIMENTS

Young healthy albino and hooded rats from local, Wistar Institute and Sprague Institute strains were employed. All of the animals were

From the Department of Ophthalmology, College of Medicine, State University of Iowa.

Read before the American Ophthalmological Society, New London, Conn., June 28, 1932.

1. Day, P. L.; Langston, W. C., and O'Brien, C. S.: Am. J. Ophth. **14**:1005, 1931.

2. Salmon, W. D.; Hays, I. M., and Guerrant, N. B.: Etiology of Dermatitis of Experimental Pellagra in Rats, J. Infect. Dis. **43**:426 (Nov.) 1928.

free from congenital ocular defects. At the age of 21 or 22 days, four young rats from each litter were isolated, one rat to a cage, and placed on a diet deficient in vitamin G. This diet was one advocated by Sherman and Spohn [3] in 1923, i. e., a synthetic diet from which the vitamin B complex was absent. To this diet the antineuritic factor of the B complex was supplied by adding an 80 per cent alcoholic extract of rice polishings. Such a diet contained little if any vitamin G. It was made up as follows:

	Per Cent
Casein (washed with 60 per cent alcohol)	18
Osborne and Mendel salt mixture	4
Butter fat	8
Cod liver oil	2
Corn starch, containing the alcoholic extract of rice polishings	68

The experimental animals were allowed unlimited amounts of the food and distilled water.

Fig. 1.—Litter mates at age of 4 months, one on a normal diet and the other on a diet deficient in vitamin G.

Simultaneously, two control animals from the same litter were isolated and placed on exactly the same diet plus autoclaved yeast. Such yeast furnished vitamin G only, the B factor having been destroyed by the heat.

All of the animals were kept in metal cages with raised screen floors; they had no access to their own excreta. An even temperature was maintained in the animal room in order to avoid exposure.

Cataracts had developed in all four of the rats from the first litter by the sixty-seventh day. Three of the animals were killed, and the eyeballs were enucleated for microscopic study.

Cataracts had developed in two of the rats from the second litter by the eighty-fourth day; the other two failed to show changes in the lens.

The rats from the third litter were 43 days old when placed on the diet. They died between the eighty-ninth and one hundred and twenty-seventh days without cataracts. These rats had acquired a store of vitamin G, and had they lived it would have taken quite some time to deplete them.

3. Sherman, H. C., and Spohn, A. A.: J. Am. Chem. Soc. **45**:2719, 1923.

Fig. 2.—Normal albino rat.

Fig. 3.—Cataract in albino rat.

Fig. 4.—Normal hooded rat.

Fig. 5.—Cataract in hooded rat.

Two animals from the fourth litter died before the experiment was completed. In a third animal cataracts developed on the sixty-third day; the other animal was placed on a normal diet on the one hundred and eleventh day, even though no changes in the lens were visible.

At the time of writing this article the rats from the fifth litter had been on the deficiency diet for eighty-four days. On the sixty-eighth day, cataracts had developed in one animal, but the other three have not yet shown changes in the lens.

Many of the cataracts developed quite rapidly; in some rats there was a noticeable advance in the opacities of the lens from day to day. In other lenses the changes progressed slowly.

Of especial interest was the observation that, in the early stages, the cataracts were of no particular morphologic type. Nuclear cataracts

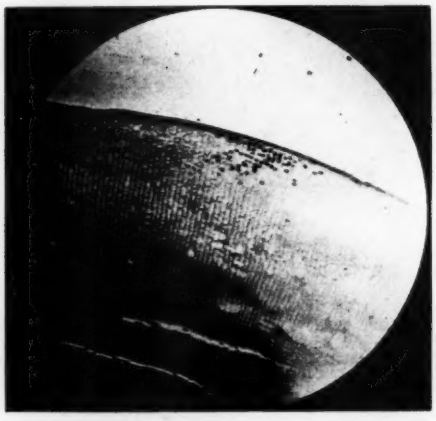

Fig. 6.—Normal lens.

were frequent; however, in some animals the opacities appeared first in the anterior or posterior subcapsular layers, and in others the changes began in the cortex. An occasional eye was seen in which the changes in the lens began as diffuse opacities in all layers. I have seen rats with a nuclear cataract in one eye and subcapsular or cortical opacities in the other. This striking and unexpected observation may be taken to indicate the futility of always expecting pathognomonic morphologic types of cataract as a complication of certain metabolic diseases, e. g., diabetes and tetany.

No matter where the changes in the lens began, the cataract eventually passed out of the stage of incipiency into that of intumescence and finally into the stage of maturity. By the addition of vitamin G to the diet, it was possible to stop immediately the changes in the lens at any stage.

The cataracts evidently were not due to simple inanition, for, in some rats, changes in the lens developed while the animal was apparently

in excellent health; also, changes do not develop in vitamin A deficiency, in which the general condition of the animal may be even worse than in vitamin G deficiency. Neither were the changes in the lens the result of inflammation or degeneration in the cornea or the uveal tract. The severity of the keratitis bore no relation to the formation of cataract.

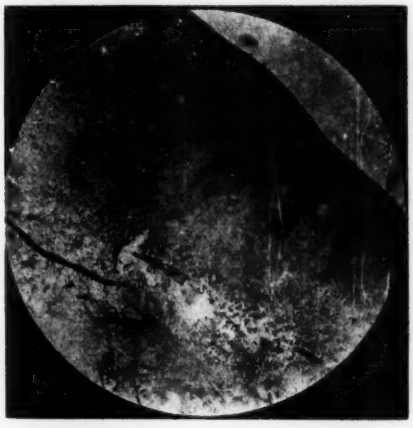

Fig. 7.—Proliferation of subcapsular epithelium and autolysis of lens fibers.

Fig. 8.—Mature cataract. Autolysis of lens fibers and morgagnian globules.

Clinically, there was no associated iritis or cyclitis, and examination of these structures under the microscope failed to disclose pathologic changes. Apparently, vitamin G has to do with the nutrition of epithelial structures, since, on a diet deficient in this factor, the hair, skin, mucous membranes and lens are affected.

Microscopic examination of several cataractous lenses revealed areas of proliferation in the subcapsular epithelium. In certain areas large masses of epithelium were found; proliferation backward over the

posterior aspects of the lens was also noted. The lens fibers had undergone autolysis, with the formation of typical morgagnian globules. In advanced cases the lens had been converted into an amorphous mass. Cholesterol crystals were noted in the older cataracts.

Microscopic study of the uveal tract, vitreous and retina revealed no pathologic changes.

Other changes occurred in and about the eyes during the second and third months of the deficiency. Such changes almost always occurred prior to the onset of the opacities of the lens. The hair over the lids became thin in many animals. During a certain stage the eyelids were swollen, and the margins were stuck together. A transitory conjunctivitis was sometimes present. The most frequent pathologic finding was that of anterior interstitial keratitis. Clinically, the cornea appeared more or less cloudy over certain areas. As a rule, the opacities were faint and nebulous and did not stain with fluorescein; however, in a few eyes, a faint diffuse greenish stain appeared. Vascularization, followed by rapid clearing, completed the clinical picture. Microscopic study of several of these eyes revealed an interstitial inflammation in the anterior half of the corneal stroma. During the acute stage the cornea appeared swollen and edematous, and the anterior stroma was infiltrated with polymorphonuclear leukocytes. In the later stages proliferation of the fixed corneal cells was seen, and fine vessels were present in the anterior stroma. In all the preparations the corneal epithelium appeared intact.

CONCLUSIONS

Cataracts developed in many young rats fed on a synthetic diet deficient in vitamin G. In order to produce such opacities of the lens, it was necessary to begin the feeding of the deficient diet as soon as the rats were weaned, i. e., about the twenty-first or twenty-second day after birth. Otherwise, the animal stored vitamin G in sufficient quantity to prevent rapid depletion. The changes in the lens did not conform to any particular type; they frequently began in the nucleus, but often they were noted in the subcapsular zone, in the deeper cortex or as a diffuse change throughout the lens. Microscopic study revealed proliferation of the epithelium, degeneration of the lens fibers and conversion of the lens into an amorphous mass, i. e., the changes typical of cataract.

Other ocular changes, such as anterior interstitial keratitis, conjunctivitis and swollen lids, frequently occurred.

ABSTRACT OF DISCUSSION

Dr. Arthur M. Yudkin, New Haven, Conn.: At the present time our understanding of the vitamin B complex is much unsettled. Until two years ago vitamin B was regarded as a substance for curing polyneuritis and promoting the growth

of animals. It was found that the complex had two factors differentiated on the basis of susceptibility to heat. The thermolabile factor was utilized to cure polyneuritis in the pigeon and the rat, and the thermostabile component was used to cure dermatitis in rats and pellagra in man, and both were required for growth. The former was labeled B, and the latter B_2 in England, and G in this country. Now, Dr. O'Brien and his collaborators offer vitamin G as a cataract-preventive substance. If these results are confirmed, they raise the question as to whether we should examine more closely the diets of patients with clinical cases of cataract. There is considerable evidence at hand indicating variability with respect to proper absorption from the alimentary tract of ingested vitamin G. It may well be, therefore, that among persons subsisting on essentially the same diet a condition of vitamin G shortage may develop in some owing to impaired absorption, gastrointestinal derangement, etc., whereas other persons are perfectly healthy in this respect. If this line of reasoning is correct, then the dietitian and the gastroenterologist should join forces with the ophthalmologist in studying the problem of cataract.

Ophthalmologic Review
EDITED BY DR. FRANCIS HEED ADLER

MODERN DEVELOPMENTS IN ORTHOPTIC TRAINING

LEO L. MAYER, M.D.
CHICAGO

The renewed interest which has been aroused of late concerning the alleviation of concomitant strabismus and the enhancement of the visual acuity in eyes with amblyopia ex anopsia has brought forth some novel apparatus with which the practicing ophthalmologist should be familiar. The purpose of this article is to review the older devices which are still held in high esteem and to describe the modern instruments with their equipment.

AMBLYOPIA EX ANOPSIA

The consensus concerning those eyes in which visual acuity is so greatly decreased below normal that ordinary pictures used in fusion instruments are not recognizable is that absolute occlusion is necessary. This fact has long been known, for as early as 1743 Buffon suggested it, and Javal, in 1856, reported cures by occlusion. Worth was emphatic in his statement published in 1903, to the effect that the primary object to be kept in mind is to prevent deterioration of the vision of the deviating eye and to restore, so far as possible, the sight of this eye, in cases in which amblyopia ex anopsia has already occurred. Peter recommended occlusion of the fixing eye for from two to three hours each day, but both Worth and Maddox agreed that absolute occlusion should be maintained for from two or three days to six weeks. Griffith concluded that efficient occlusion is necessary, and he expressed the belief that operation should not be delayed when it is plain that glasses and occlusion will not bring about a rapid cure.

Two methods of occlusion have proved satisfactory. By absolute sealing off of the fixing eye with a collodion or similar bandage, there is no chance of peeking. Atropinization of the better eye, with the accompanying paralysis of accommodation and the greater possibility of aberration, causes the amblyopic eye to be forced into use. Worth advises against the latter procedure, unless central fixation is good

The prescribing of bifocal lenses to relax accommodation seems to be of questionable value and has given poor results in the hands of most authorities.

THE AMBLYOSCOPE

This instrument, designed by Worth and improved by Black, has stood the test of time. It is a modification of the Priestly Smith tubes, and allows for a varying amount of convergence to focus images on the maculae. It consists essentially of two tubes 1½ inches (3.77 cm.) in diameter so bent and joined together that movements of convergence and divergence may take place through a considerable angle. At the further end of each tube is a picture carrier, which allows for the placing of celluloid pictures, through which illumination takes place because of the translucency of the celluloid. Where each tube bends a mirror is placed, thus allowing each eye to see its corresponding picture. At the observing ends of the tubes is placed a convex lens having a focal length of 5 inches (12.7 cm.)—the distance of the reflected image of the object slide—which aids in producing the effect of distance perspective. By angling the tubes, if binocular vision is present, the two pictures seen by each eye separately will be brought together and fused. Black's modification consists in a mechanism to raise or lower one of the tubes, thus taking care of any vertical deviation. The far ends of the tubes have also been supplied with electric bulbs, which allow for changing the amount of light coming through each picture, and thus each may be illuminated more or less distinctly at will. A graduated arc shows the amount of deviation or of convergence and divergence employed.

THE STEREOSCOPE

The American or Holmes model is a modification of the Brewster model, which was perfected in 1849, but which has an adjustable card carrier instead of a box. A pair of + 5.25 diopter spherical lenses, which are decentered, produce a prism of about 8° base out before each eye. Thus, by sliding the card carrier, a varying amount of convergence is used to focus the pictures on the macula. Wells expressed the belief that the stereoscope has an advantage over the amblyoscope in that an observer is able to see the patient's eyes and knows what is taking place. He advises the use of a 15° prism base out, inserted in a slit provided for extra lenses, before each eye to take care of cases of marked esotropia. While the ordinary card carrier allows movement to and from the eyes, another carrier which is manufactured is equipped with a mechanism that moves the two pictures either closer together or farther apart. In his book, Wells described a modified stereoscope which he called a phoro-optometer stereoscope. In this instrument, an endless screw makes possible the separation and approxi-

mation of the images. Mention should also be made of the clever stereoscope devised by Hartleib. It is a modification of the original Wheatstone idea, having holders for pictures on either side reflected into the eyes by two angled mirrors. These central mirrors may be moved close to the eyes or farther away, at will. Many of the objections found in the prism effects are missing in this instrument.

STEREOSCOPIC PICTURES

Many types of pictures are on the market, and the four series which have been found to be of especial use in orthoptic training are as follows: the Wells series, the Sattler pictures, the child's series and the "R-G method" charts. Other special types used in conjunction with a specific instrument will be described later.

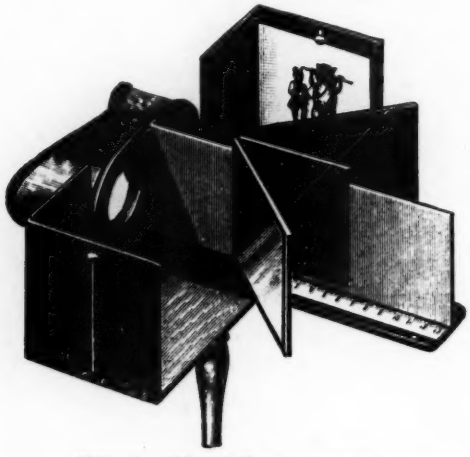

Fig. 1.—Hartleib stereoscope.

The Wells pictures are in reality a series taken from various authorities, such as Javal, Dahlfeld, Kroll, Hale, Shuman and Sattler, to which Wells has added others; he has classified them into nine groups. The A series is for patients with almost total suppression of one eye, who have no perception of depth and simply combine dissimilar objects. The first two pictures in this group consist of a small bird and a large cage, the larger object being seen by the eye with the least vision. The B series measures fusion distance on a centimeter scale. The C series consists of half pictures with a common element in each, which enables the operator to check the suppression of one eye as fusion is necessary to see the entire object. For cultivation of perspective or stereopsis, various pictures of the E series depicting objects at seemingly varying distance may be tried. The F and G series are similar, consisting of stereoscopic photographs of reading matter, beginning

with large type and decreasing to fine type, thus enabling the development of refined fusion. The H and I series are similar and cultivate amplitude of fusion by the viewing of objects separated at graded horizontal distances from 2.5 to 11 cm. For training stereopsis, the J series has printed words with receding and advancing levels as the words are read up and down on the card.

The Sattler series consists of forty-five paired pictures which may be used in the ordinary stereoscope with a card in the carrier having a band around it to keep the individual pictures from falling, or may be used in the stereoscope with the lateralizing mechanism. The first two pairs have no perspective and are used merely to determine accurately the proper distance at which the following pictures should be viewed and to give an idea as to whether both parts of the picture are reaching consciousness equally well. Most of the remainder of the series serves to determine whether a sense of depth is obtainable, and because each half separately furnishes no sense of perspective, fusion is necessary for the estimation of relative distances of the objects in the picture. Because some of the pictures are taken at wider angles than others, the ability to fuse these comes only after more time and greater effort. Thus, the amplitude of fusion may be educated.

The child's series, as its name implies, is especially adapted for youngsters before the school age. A test or X card shows a Brownie with a pointer in his hand on one half. For the other eye familiar objects, such as a block or an apple, are shown, being separated at centimeter distances. Thus, according to the object pointed to, the degree of separation in centimeters is read directly. The B cards are of two types: One consists of a series of blocks with the letter A combined with a dot above and to the right for the left eye and below and to the left for the right eye; the blocks are separated at varying distances. The other type consists of a set of simple pictures of a boy, a dog and a cat, with the names beneath in large print, the middle letter alone being common to both halves of the card. The A series consists of a group of stereoscopic colored pictures illustrating Mother Goose rhymes, which may be read from the back of each picture.

The "R-G method" pictures are the newest type and in reality should not be classified under stereoscopic pictures, but rather as visual training stimulators. However, these charts, with a drawing printed in faint blue or green on one half of the card, are used in the stereoscope or a similar instrument. The patient is provided with a double color filter, a red light filter before one eye (preferably the amblyopic one) and a green light filter before the other. The patient is provided with an orange or red pencil to copy the drawing. Thus, the printed drawing is seen only with the one eye, and the pencil and patient's own drawing marks are seen with the other eye because of the red and green

filters. The drawings and designs are arranged in four types: all black, so as to be visible to both eyes, the pencil marks alone being invisible to the eye behind the red; all blue, the design being visible to one eye only, while the pencil marks are seen only by the other eye; part blue and part black, and part blue and part red. This method is particularly recommended in cases in which occupational perversion of coordination of the hands and eyes has reduced the appreciation of stereopsis, as in typists and comptometer operators, who are required to interpret one set of objects and forms in one location through ocular sensation, while using the hands in an entirely different location.

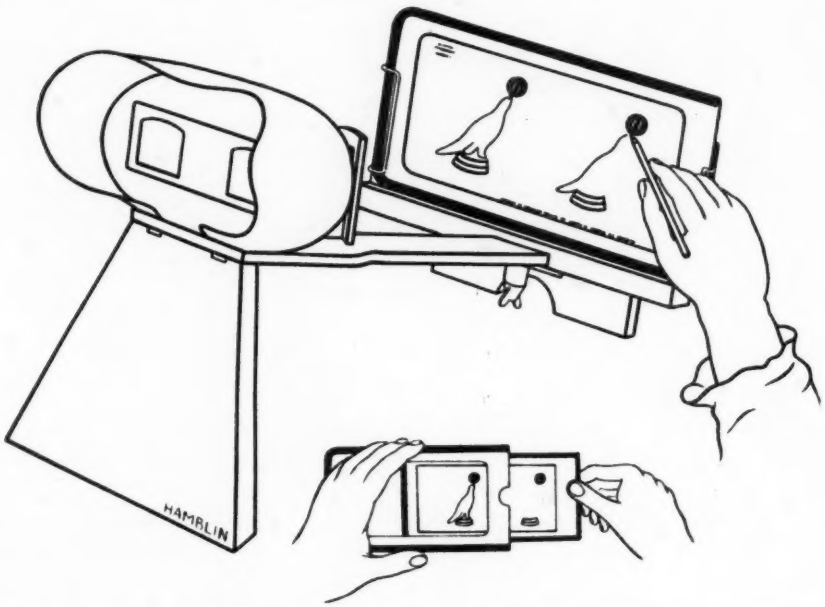

Fig. 2.—The Whittington stereoscope pictures and drawing stereoscope (coordination of hand and eye).

THE WHITTINGTON DRAWING STEREOSCOPE

This is a recently described English instrument, which coordinates the hand and the eye in a drawing stereoscope. Wax tablets are used, and thus, by marking with a style over transparent celluloid, the marks may be erased quickly by sliding the tablet out of its holder, therefore allowing innumerable drawings to be made on one tablet. The instrument is essentially a stereoscope with a base instead of a handle. The base, together with the heavy slide, provides adequate support for drawing purposes. Two sets of pictures of ten each, one set easy and the other more difficult, are provided. In cases of convergent squint, the single picture on one half of the tablet is placed as far from the eye as possible, and the patient's drawing is made on the other half.

THE STEREOCAMPIMETER

The ten slides provided for this well known instrument are transilluminated by a special, electrically lighted box. The slides are classified into four groups. For adjustment and measurement, the well known Wells centimeter scale is used. For fusion training and muscle exercising, three slides are recommended. The first is the F-L slide, which needs no comment. The other two consist of words which must be

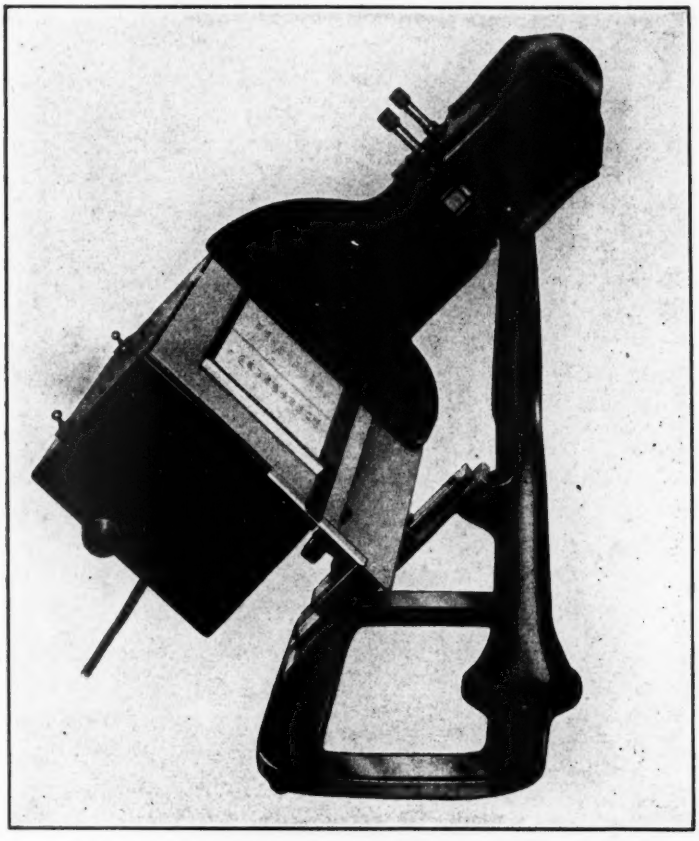

Fig. 3.—Stereocampimeter equipped with new adjustable light box.

read downward, the first slide having a convergence skip of 1 prism diopter between each word, and the second, a skip of 2 prism diopters. Incomplete arrows and circles are mixed with the words for suppression tests. For small children, a group of familiar pictures of animals is arranged on two slides in a similar fashion. For the perception of depth, two slides are provided. One has a circle with an arrow through it, which points toward the observer, who has perception of depth. Two diopters of convergence is necessary in passing from the tail to the point of the arrow. The other slide in this group is called the "Battleship

Texas" slide and is also found in the Wells set. Large objects are clearly seen at varying distances in perspective. For perception of depth and interest, there are two slides which have many objects at various distances in stereopsis. One is a picture of lower Manhattan; the other shows a farmyard scene. The combination of an instrument for study of the visual field and the blind spot, together with slides for orthoptic exercises, makes for double value.

LONSDALE PROGRESSIVE STEREOGRAMS

The five cards for use in the stereoscope are an English product supplied in duplicate. The advertised description is perhaps the clearest. Each half of a stereogram consists of six vertically inclined, pale gray circles on a black background, each containing part of a letter or figure not easily recognizable before fusion takes place. When in fusion, the circles containing the letters or figures are seen to stand out in bold relief. The range covered is spread over five cards, in duplicate, extending from 2.5 to 10 cm., and represents a total of 39 prism diopters. This total is obtained by twenty-six divided letters (or figures), the end letter on each card being repeated on the next card in order to provide a jumping-off point for the patient. The separation between two consecutive letters on the cards represents 1.5 prism diopters, and provides an interesting means of giving jump exercises. For a patient with esophoria or esotropia, a suitable card is chosen, and the patient reads from the bottom upward. In cases of exophoria or exotropia, the patient reads from the top downward.

THE MADDOX CHEIROSCOPE

This is the American model of the instrument designed by Maddox, which attempts to train the eye in connection with the hand. The set-up consists of a stereoscopic head rest with accommodation for prisms and spheres, to which two illuminating lamps controlled by separate rheostats are attached, which give variable illumination to either side. The base is used as a large drawing board. Instead of direct vision of the object to be drawn, there is a frame to hold the object pictures adjustable to either side, the picture being deviated to the observing eye by a mirror on the septum, which separates the two fields of view. Accommodative effort is avoided for the distance of 5 inches from the head rest to the drawing board by the use of + 8 diopter spherical lenses. A revolving disk or turntable may be adjusted on the base to be used in the stimulation of amblyopic eyes. A rotating object plate is also furnished which fits into the picture holder being used for binocular exercises. Various pictures and objects are supplied. In addition, the instrument may be easily transformed into a stereocampimeter,

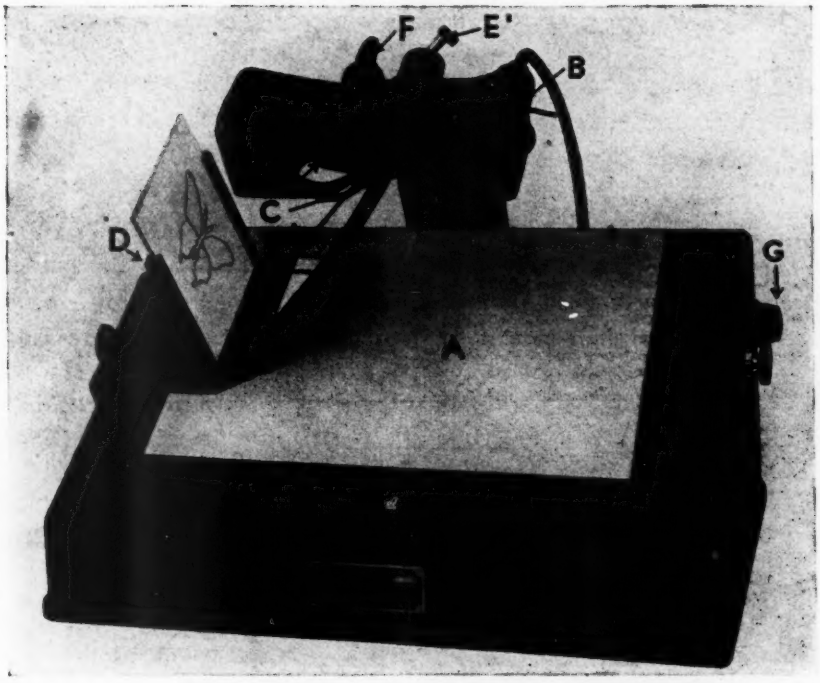

Fig. 4.—The Maddox cheiroscope, ready for tracing images. *A* indicates the drawing platform; *B*, the head rest; *C*, clips for prisms; *D*, a drawing holder; E, a mirror; *E'*, a mirror regulator; *F*, a lamp for the left eye; *G*, a rheostat.

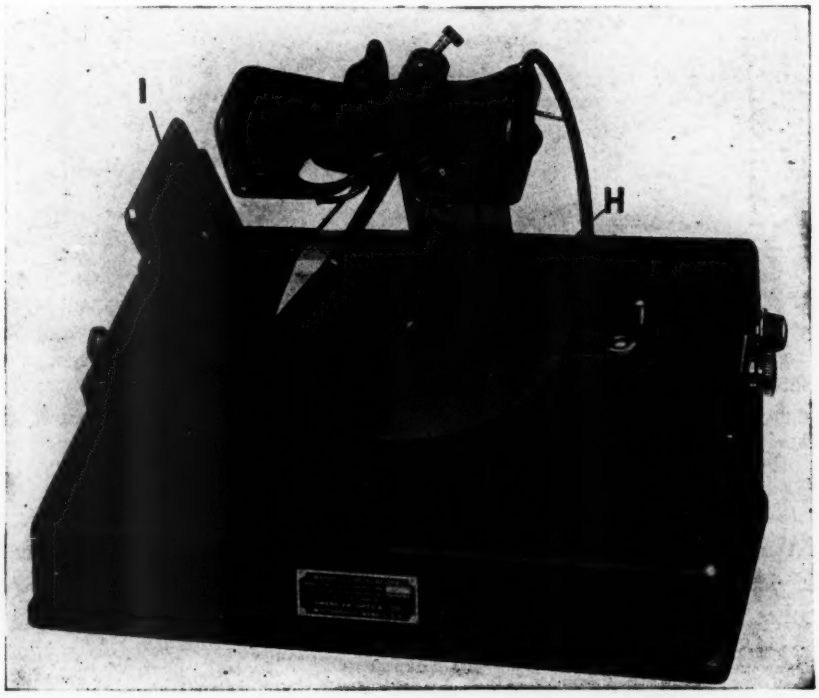

Fig. 5.—The Maddox cheiroscope, with revolving disk (*H*) and felt plate (*I*).

enabling studies of the visual field to the extent of 25° superiorly and inferiorly and 35° temporally and nasally. Campimeter charts and test objects are a part of the equipment.

A NEW SYNOPTISCOPE

This English instrument, which was formerly known as the synoptophore, has recently been improved with the cooperation of Maddox. A detailed description would be ambiguous; however, the essential

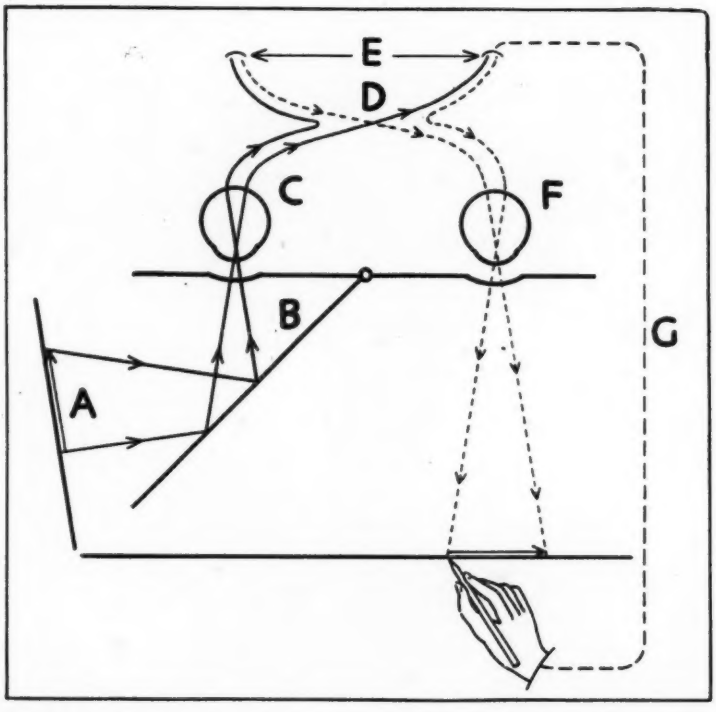

Fig. 6.—The Maddox cheiroscope, showing the mirror action. The diagram shows how the active macular brain centers will stimulate and educate the corresponding sluggish macular brain areas and will combat any inclination toward suspenopia. The hand acts to lead the eye and to record the visual progress. *A* indicates the object; *B*, the mirror; *C*, the normal eye; *D*, the chiasm; *E*, visual brain centers; *F*, the amblyopic eye; *G*, the impulse from the motor brain centers to the hand.

points are important. On a massive base are supported a chin rest and two columns, the latter in turn carrying the large ocular elements. The ocular elements are in reality chambers in which stereoscopic pictures of various types may be placed. These are viewed through lenses 18 mm. in diameter reflected by stainless steel mirrors, which

mirrors may be swung out of position to permit accurate adjustment of the pupillary distance. Illumination may be provided in three distinct ways:

(*A*) Transmitted artificial light for the illumination of slides and other transparencies.

(*B*) Reflected artificial light provided within the chamber for use with stereoscopic pictures, such as those in the Sattler series. Experimental drawings may also be illuminated in this way.

(*C*) Daylight transmission through translucent slides by the use of reflectors.

Each illuminating element may be regulated separately by rheostatic control in order to vary the intensity of illumination on the object

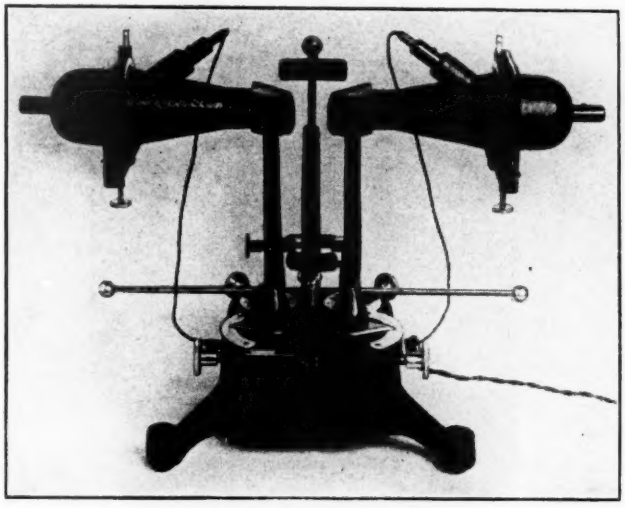

Fig. 7.—Synoptiscope.

viewed. Adjustments are provided to cause vertical, horizontal and cyclophoric changes in the object viewed, and are registered in degrees of angles. There is no interference in the axes of rotation of the eyes in these movements. A flasher is also provided by means of which rapid and instantaneous illumination of the picture serves to test the alertness of the patient. The stereoscopic pictures supplied are the Kroll series and the "Uncle Pop" series. The latter is especially suitable for children, being composed of cartoons from a well known Sunday paper. Transparent slides are taken from many of the better known sets of stereoptical pictures.

THE TELEBINOCULAR

The telebinocular is a modified stereoscope with tubular observation elements and a sliding shaft. The lenses are those usually found in the

American model stereoscope, a + 5.25 diopter spherical combined with an 8° prism base out; both lenses, however, are taken from the same piece of glass. The field of vision viewed through a single ocular gives, at 24 cm., about 15° around the central portion. Thus, the use of the instrument as a campimeter is limited. However, for the demonstration of small central or cecocentral scotomas, well saturated red and green cards are provided. Stereoscopically, these cards are recognized as a neutral gray. Consequently, any interference with fusion due to a scotoma in one eye will be noted by diffusion rings of color. The pictures are illuminated by a single, constant lamp. In addition to many photographic pictures, some with stereopsis throughout and others with

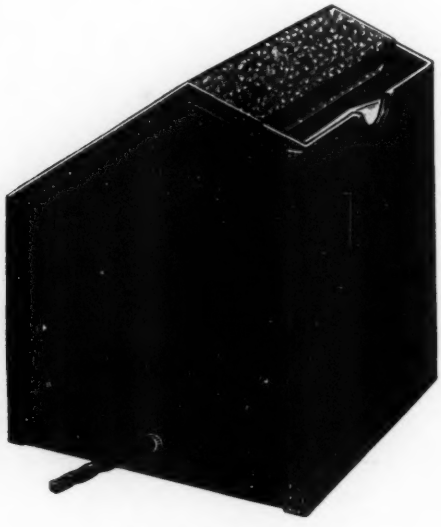

Fig. 8—Javal grill.

certain objects in stereopsis, there is a set of split slides. The latter may be separated or approximated in a horizontal position for the exercising of the lateral muscles. Drawings are also provided for training of the hands and eyes. The inexpensiveness of the instrument recommends it.

THE JAVAL GRILL

This reading box is a modification of the original Javal prongs and gives to the bar or pencil test some element of interest. The forehead rests on the top of the box, and movements of the head are avoided. On looking through the box, a series of grills prevents the reading of a continuous nature if fusion is not present. The boxlike structure adds an element of mystery, which is stimulating.

COMMENT

While other instruments are found on the market, the majority of them are modifications of those just described. It is felt that a knowledge of those developments will enrich the field of orthoptic training.

The instruments described may be obtained from the following companies:

The ordinary stereoscope, Wells' charts, the horizontally adjustable stereoscope, the amblyoscope and the Maddox chieroscope, from American Optical Company, Southbridge, Mass.

The child series of stereoscopic pictures, from Optical Research and Development Company, Spokane, Wash.

The Sattler stereoscopic pictures, from Ferdinand Enke, Stuttgart, Germany.

The Telebinocular equipment, from Keystone View Company, Meadville, Pa.

The Whittington stereoscopic drawings, from Theodore Hamblin, Ltd., London, England.

The Stereocampimeter and equipment, from Bausch and Lomb Optical Company, Rochester, N. Y.

The Lonsdale stereograms, from Clement Clarke and Company, Ltd., London, England.

The "R-G method" stereoscopic pictures and the Javal grill "reading box," from the Post-Graduate Eye Institute, Chicago.

The synoptiscope, from either Curry and Paxton, Ltd., or Clement Clarke and Company, Ltd., London, England.

The Hartleib stereoscope, from R. Wurach, Berlin, Germany.

BIBLIOGRAPHY

Black, N. M.: Ophth. Rec. **15**:55, 1906.

Chavasse, B.: Tr. Ophth. Soc. U. Kingdom **50**:168, 1930.

Griffith: Tr. Ophth. Soc. U. Kingdom **51**:286, 1931.

Hartleib, R.: Klin. Monatsbl. f. Augenh. **86**:367, 1931.

Maddox, E. E.: Tests and Studies of the Ocular Muscles, Bristol, England, John Wright & Sons, Ltd., 1898; Tr. Ophth. Soc. U. Kingdom **51**:296, 1931.

Peter, L. C.: The Extra-Ocular Muscles: A Clinical Study of Normal and Abnormal Ocular Motility, Philadelphia, Lea & Febiger, 1927.

Sattler, C. H.: Klin. Monatsbl. f. Augenh. **81**:182 (Aug. 31) 1928.

Wells, D. W.: The Stereoscope in Ophthalmology, ed. 4, Southbridge, Mass., American Optical Company.

Whittington, T. H: Brit. J. Ophth. **16**:105 (Feb.) 1932.

Worth, C. A.: Squint: Its Causes, Pathology, and Treatment, ed. 5, London, Baillière, Tindall & Cox. 1921.

News and Notes

EDITED BY DR. JOHN HERBERT WAITE

GENERAL NEWS

Scientific Exhibit, Milwaukee Session of American Medical Association.—Application blanks are now available for space in the Scientific Exhibit at the Milwaukee Session of the American Medical Association, June 12 to 16, 1933. The final date for filing such applications is Feb. 13, 1933, after which time assignments of space will be made. The Committee on Scientific Exhibit requires that all applicants fill out the regular application form. Persons desiring to receive application blanks should address a request to the Director, Scientific Exhibit, American Medical Association, 535 North Dearborn Street, Chicago.

Annual Midwinter Course in Ophthalmology and Otolaryngology.—The annual midwinter course in ophthalmology and otolaryngology will be held in Los Angeles, Jan. 16 to 27, 1933, inclusive. The lecturers in ophthalmology will be Dr. John Weeks, Dr. Bernard Samuels, Dr. Sanford Gifford, Dr. Joseph McCool and Mr. E. B. Burchell. The principal didactic course will include the treatment of progressive myopia, histopathology of the eye, conditions of the ocular muscles and their treatment, bacteriology of the eye and various procedures in ophthalmic therapeutics. In addition, there will be diagnostic and operative clinics by the various lecturers and members of local hospital staffs. The fee for the entire course will be $50—$25 payable on registration, and $25 on arrival in Los Angeles. A detailed printed program may be obtained on request from Dr. Don Dryer, 2007 Wilshire Boulevard, Los Angeles.

Undergraduate Teaching of Ophthalmology.—The Committee on the Undergraduate Teaching of Ophthalmology, after a study made by questionnaires, has made its report with recommendations to the American Academy of Ophthalmology and Otolaryngology: 1. Ophthalmology should be a compulsory subject, both in didactic and clinical phases. 2. Ophthalmology should form a separate department with individual staff and individual budget. 3. The department of ophthalmology should cooperate with the departments of anatomy and physiology in the instruction in ophthalmic subjects of the first two years. 4. The ideal undergraduate course in ophthalmology should embrace sixty actual hours, of which about one-third are devoted to didactic instruction and two-thirds to clinical ophthalmology. Elective courses should be offered after the required work of the third year is successfully completed. 5. Research among undergraduates should not be encouraged. 6. All modern aids to teaching, such as motion pictures and lantern slides should be utilized. 7. Each instructor should have the certificate of the American Board of Ophthalmic Examinations.

International Ophthalmological Congress.—The International Congress will be held in Madrid from April 16 to 22, 1933, under the patronage of the President of the Republic of Spain. The official subjects selected for discussion and the speakers are: (1) Tuberculosis of the Iris and Ciliary Body, Dr. Brown of Chicago, Dr. Igersheimer of Frankfort and Dr. Lagrange of Paris; (2) Detachment of the Retina, Dr. Ovio of Rome, Dr. Vogt of Zurich and Dr. Arruga of Barcelona. Communications should be addressed to the Executive Committee, 3 calle Olozaga, Madrid. The price of inscription for members of the congress is $10, and for the ladies, $5. Official receptions, theatrical performances, bull fights and excursions to Toledo and the Escurial will be organized.

SOCIETY NEWS

Ophthalmological Society of Paris.—The society held its first annual meeting on Nov. 20, 1932. The subjects under discussion were: (1) A Symposium of Trachoma and Its Treatment; (2) An Experimental Study of Syphilis and Neurotropic Virus as Applied to Ophthalmology, by Professor Levaditi; (3) The Etiology and Treatment of Tabetic Optic Atrophy, by Mme. Schiff-Wertheimer with the collaboration of Professor Lhermitte.

CORRECTIONS

In the discussion on his paper, entitled, "Cyclodialysis Combined with Iridectomy in Glaucoma Simplex: A Preliminary Report," an abstract of which was published in the November issue (**5:** 777, 1932), Dr. Wooton is quoted as saying: "I made two scleral incisions. The first one is made for cyclodialysis; then, about a week later, another incision is made for the iridectomy." Dr. Wooton advises that he was incorrectly quoted; that the iridectomy is performed at the same sitting as the cyclodialysis and immediately following it, and that the performance of the iridectomy at this time is the most important part of the procedure.

This is the corrected form of an abstract which appeared in the November issue of the ARCHIVES (**8:** 782, 1932) in the Transactions of the American Ophthalmological Society.

MOOREN'S ULCER. DR. ARTHUR J. BEDELL, Albany, N. Y.

The author presented two cases of Mooren's ulcer. In one case, presented before the American Ophthalmological Society in 1921, the vision had improved to 3/200 in each eye. The corneas were more convex than normal, and showed marked limbus vascularization and extensive interstitial clouding, with small calcified flakes. There was widespread pigmentation on the lens capsule. This is the first case which has been illustrated with stereoscopic photographs taken years after its onset.

The other case had not been presented before the society, and was noteworthy because of the tuberculous infiltration of the conjunctiva and episcleral tissues. The patient was a 43 year old woman whose right eye was enucleated because of an intractable ulcer. The left showed a deep, white arc of corneal ulceration near the lower limbus, which progressed despite all forms of treatment, and perforated about six months later. Shortly thereafter the eyeball was removed. Microscopic examination was made by Dr. Verhoeff, and his diagnosis was "episcleral tuberculosis and perforation of the cornea." The clinical course of the disease was illustrated with colored stereoscopic photographs. This is one of the few cases of Mooren's ulcer in which tuberculosis seemed to develop in the latter stages of the disease.

Obituary

HERMANN PAGENSTECHER, M.D.

1844-1932

Hermann Pagenstecher died on April 11, 1932, aged 88, in Wiesbaden, Germany, where he had worked for so many years.

After attending the universities of Würzburg, Berlin and Prague, Pagenstecher became assistant in the University Eye Clinic at Greifswald in 1868, and in 1869, he was associated with his brother in the Eye Clinic at Wiesbaden. Subsequently, he made two long visits to Moorfields Eye Hospital, where he devoted himself particularly to studies on pathology of the eye. After the death of his renowned brother, Pagenstecher took over the direction of the Eye Clinic in Wiesbaden, which had both private and charitable departments. The institution grew rapidly as the fame of its director became well known.

Dr. Pagenstecher's scientific contributions consisted in studies of pathologic, clinical and operative questions in ophthalmology, the best known of these being on the pathology of the vitreous. He published, together with C. Genth, an atlas on the pathology of the eye. With his brother, he devised a method of cataract extraction in the capsule, which was applied to hypermature and certain other forms of cataract, with excellent results in hundreds of cases. He also suggested the suture operation for ptosis, the advancement of the levator in entropion of the upper lid and in deformity of the tarsus after trachoma, and the systematic resection of the optic nerve to prevent the transference of sympathetic ophthalmia.

Pagenstecher's operative technic was remarkable and imposing, both as regards delicacy of touch and surety. At the same time his greatest success was his medical knowledge. A very large clinical experience developed a remarkable medical intuition in the recognition of complicated conditions associated with a most careful method of examination and the proper estimation of symptoms. His fame rapidly extended beyond his home; many American and British patients sought his aid, and his clinic assumed an international character. For relaxation, he devoted himself to the appreciation of nature and art. He was a great physician, a man of a quiet, retiring and kindly nature.

O. SCHEFFELS, M.D.,

Klinische Monatsblätter für Augenheilkunde, July, 1932.

Abstracts from Current Literature

EDITED BY DR. WILLIAM ZENTMAYER

Bacteriology and Serology

BACTERIAL CULTURES OF EMULSIONS OF THE SUBSTANCE OF THE CRYSTALLINE LENS. A. MIKLOS, Klin. Monatsbl. f. Augenh. **87:** 544 (Oct.) 1931.

The relationship between the epithelium of the lens and that of the conjunctiva favors the development of xerosis bacilli and pneumococci. This, in Lindner's opinion, is the cause of panophthalmitis after cataract extractions. Miklos found that emulsions of the lens substance offer a better cultural medium than other substances used for the purpose. The number of the bacteria depends on the water content of the cortical substance. Miklos continued his research by adding emulsions of lens substance to a number of the customary fluid cultural mediums; pneumococci and xerosis bacilli yielded an excessive growth on this combination, while Bacillus pyocyaneus and Staphylococcus aureus and albus grew only moderately. The bactericidal action of the aqueous humor on pneumococci was weak, especially when it contained cortical substance. Experiments proved that so-called immature cataracts offer the greatest operative risk as regards infection. Intracapsular extractions, therefore, will reduce this risk.

K. L. STOLL.

PNEUMOCOCCUS IN THE EYE. R. C. MIKAELJAN, Klin. Monatsbl. f. Augenh. **87:** 778 (Dec.) 1931.

The types of pneumococci and their importance in prognosis have been differentiated for infections of the human body. A small number of publications exists with reference to infections of the eye. Neufeld, Haendel and others succeeded in differentiating four serologic types of pneumococci. To establish these four types the author examined twenty-one cases of ocular disease, including seven cases of serpent ulcer, eleven of purulent dacryocystitis, two of pneumococcic conjunctivitis and one of panophthalmitis. Neufeld's method and Mikaeljan's agglutination reaction are described. The author found that in his material types I and II of the pneumococcus were predominant in serpent ulcer of the cornea and in dacryocystitis, in contradiction to the findings in other countries. The occurrence of these two types in the two diseases mentioned may explain their clinical correlation.

K. L. STOLL.

Conjunctiva

ELASTIC TISSUE OF THE TARSUS IN GENERALIZED ARGYROSIS. C. GALLENGA, Rassegna ital. d'ottal. **1:** 5 (Jan.-Feb.) 1932.

The author studied histologically the lids of a patient with generalized argyrosis. Other students of the problem have shown the affinity of elastic tissue for silver salts, which afforded an opportunity in the present case

to trace the elastic tissue impregnated with silver in vivo. Previous work in argyrosis and the anatomy of the elastic system of the lids is reviewed. Silver was not found in the epithelium of the skin or conjunctiva. The apparent staining of the surface was due to granules of silver deposited around the fine vessels entering the epidermal papillae and in a dense network of elastic fibers just beneath the epithelium of skin and conjunctiva. It was present in large amounts all through the lid wherever elastic tissue was present, especially in the tarsus, where a network surrounded the meibomian glands. It existed in the form of minute granules deposited on the elastic fibers and within the cells themselves, as was seen in the sections of fibers cut transversely. The layer just under the epithelium was distinct from the deeper layer which sent processes between the glands, except near the border of the lid, where the two layers fused. The fibers around the meibomian glands were condensed to funnel-shaped sleeves around the excretory ducts.

In localized argyrosis of the conjunctiva the silver is deposited almost exclusively in the subepithelial elastic layer, without penetrating to any extent into the tarsus. Such a condition is usually found only in diseased lids, so that the distribution of elastic tissue is much better studied in cases of generalized argyrosis.

S. R. GIFFORD.

PHLYCTENULAR CONJUNCTIVITIS AND TUBERCULOSIS. M. TEJEDA, Arch. de oftal. hispano-am. **32:** 219 (April) 1932.

The author does not consider a relation between phylctenular conjunctivitis and tuberculosis as settled. The great frequency of a positive tuberculin reaction in the former is not conclusive.

In this paper he considers a hundred cases of phlyctenular ophthalmia studied in relation to tuberculosis from the standpoints of their history, clinical symptoms, reaction to tuberculin and roentgen examination. As regards the history, in twenty cases the existence of an infecting focus in the patient was demonstrated. As regards the clinical manifestations, eighteen presented symptoms of tuberculosis, fifteen being scrofulous. A positive tuberculin reaction (Pirquet-Mantoux) was found in eighty-six cases. Eighteen patients showed positive lesions by roentgen examination. The author found fourteen cases with a negative tuberculin reaction, one of which he reports in detail in which no clinical relation to tuberculosis could be demonstrated.

He considers that, apart from local applications, general treatment of possible coexisting tuberculous and focal lesions is important.

C. E. FINLAY.

Cornea and Sclera

ANNULAR INTERSTITIAL INFILTRATION OF THE CORNEA IN MALIGNANT LYMPHOGRANULOMA. HENRI LAGRANGE, Ann. d'ocul. **169:** 188 (March) 1932.

There are three peculiarities in the nature of this condition, which should be emphasized:

1. Its great rarity. This is the first case that I have personally observed. Also its semiologic peculiarities are striking (annular organization, successive growths and comparative inactivity).

2. The existence of a deep limbus neovascularization, with infiltrated growth, which would naturally make one think that this corneal lesion ought to be composed of Sternberg cells, the origin of which, being reticulo-endothelial, is much the same.

3. The action of radiotherapy on the progress of the lesion, which confirms what has been said on radiosensibility of specific cells of malignant lymphogranuloma.

S. H. McKee.

Clinical Etiologic Data of Bilateral Recurring Abrasions of the Cornea: Report of Cases. S. Spektor, Klin. Monatsbl. f. Augenh. **87:** 661 (Nov.) 1931.

Recurring abrasions of the cornea may be of traumatic or spontaneous origin; insignificant trauma may occasionally escape detection. The clinical aspect of both types is similar, but spontaneous erosion takes a more severe and protracted form. Infections, vasomotor trophoneurosis and the virus of herpes are mentioned, together with other etiologic factors, by divers authors. Spektor reports four cases of spontaneous abrasions of both corneas which resisted several forms of treatment. Injuries of the eyes did not exist, but entozoa were found in three of these patients, who recovered promptly after the proper internal treatment. Anthelmintic treatment was equally successful in the fourth case, although the worms remained undetected. Ascaris lumbricoides was present in all three of these persons, and in one also Taenia saginata. Spektor did not observe the formation of a bleb prior to the development of new erosions. These lesions are, in his opinion, produced by toxic products of the entozoa. Small children are frequently relieved of photophobia as soon as they get rid of the entozoa.

K. L. Stoll.

Lens

Uni-Ocular Zonular Cataract. F. W. Law, Brit. J. Ophth. **16:** 385 (July) 1932.

After a brief review of the literature the author reports six cases which came under his own observation and two additional cases the notes on which were accessible. This is followed by a discussion of the growth and nutrition of the lens, lamellar cataract and traumatic cataract.

A review of twenty-two cases of uniocular zonular cataract shows a very high percentage of cases in which there was a history of nonpenetrating injury sustained at an early age. The author reaches the following conclusions:

1. The cause of a uniocular cataract is trauma, almost invariably of the nonepenetrating variety.

2. The injury is of a kind to cause a tendency toward dislocation of the lens; in half the cases, dislocation actually occurs.

3. The cause of the zonules or lamellae of opacity is a temporary disturbance of the nutrition of the lens, brought about most probably by a severance of physiologic connection between lens and capsule, with a consequent alteration in the capsular permeability.

4. The recorded cases support the view that such a type of opacity is more likely to occur in a young, actively growing lens than in an adult lens.

5. While it might be suggested that inflammation is an alternative cause of a zonular opacity, the immediate cause being presumably a chemical or toxic action by the nutrient fluids, such a suggestion finds no support in this investigation.

W. ZENTMAYER.

CATARACT. R. H. ELLIOT, Practitioner **128:** 481 (May) 1932.

According to Elliot, the earlier a mature cataract is operated on, the better. The patients are usually elderly, and though even extreme old age does not constitute a bar to the operation, every year younger is an advantage at a time of life when deterioration is much more rapid than in the earlier decades. No patient should be allowed to drop his ordinary activities and sink into listlessness. Once a patient reaches the stage when he can no longer get about comfortably, or when he cannot read, write and carry on his usual occupations, he should be operated on without delay. To the skilled operator, immaturity of cataract presents no real difficulty. The fact that a cataract is commencing in the opposite eye is an added reason for early operation on the first one. The exact time for operation demands careful thought. The guiding principle is to get the first eye operated on and to give it time to become strong and useful before the second becomes too blind to be serviceable. This necessitates operating on immature cataracts in those cases in which cataract of the second eye follows that of the first after a short interval. Though a patient has a good result in one eye, the second should be operated on if cataractous, for the following reasons: 1. The sight of the first eye may be lost through injury, retinal hemorrhage, glaucoma or other dangers common to the old; when sight is concerned, no risks should be taken and every vestige should be conserved; therefore, the margin of safety must be made as wide as possible. 2. Binocular vision is much better than monocular, and much safer. 3. The longer the operation is put off, the greater the age of the patient and therefore the greater the risk of trouble.

EDITOR'S ABSTRACT. [J. A. M. A.]

SPONTANEOUS RESORPTION OF CATARACT. P. VANCEA, Arch. d'opht. **49:** 78 (Feb.) 1932.

The author points out the extreme rarity with which cases of this kind have been reported in the literature, most of them isolated instances. The majority of the cases have been explained by various types of complications, which, however, did not occur in the two cases described. Both these were instances of congenital cataract, free from signs of inflammation. In one case, general examination revealed a marked vagotonia associated with hypocholesteremia and hypocalcemia of low degree. In the second case, general examination revealed cardiovascular instability of parasympathetic origin, eosinophilia, slight hypocholesteremia and a low blood pressure. These observations led the author to wonder whether the resorption of the cataract, the eosinophilia, the hypocholesteremia and the vagotonia have a common cause, due especially to an endocrine dysfunction of the pancreas. He refers to the

experimental work of Lautenoise, R. LeGrand and Vidacovitz, who have shown that the pancreas plays an important part in the maintenance of the tone and excitability of the vagus, etc., and to his own research in collaboration with D. Michael, showing that insulin accelerates the resorption of naphthalinic cataract. These researches seem to indicate that hypofunction of the pancreas (the appearance of cataract) produces in the lens effects that are diametrically opposed to those of hyperfunction (resorption of cataract).

S. B. MARLOW.

DISEASES OF THE LENS. CIRINCIONE, Ann. di ottal. **59:** 769 (Sept.-Oct.) 1931.

This article is a continuation of the notes for the late Cirincione's proposed text. What makes these notes worthy of remembrance is the author's care in presenting important details of diagnosis and treatment so that any student would grasp their importance.

In the diagnosis of cataract the necessity of examination with the dilated pupil is insisted on, and the dangers of mistaken diagnosis, especially that of cataract for simple glaucoma, are emphasized. In considering the determination of when a cataract is mature, the author differentiates between anatomic maturity and clinical maturity, in which the lens is not completely opaque, but the cortex has become loosened from its capsule and may be removed in total. In defending his preference for the combined capsulotomy operation for cataract, he insists on greater safety of the procedure as compared with the simple operation. "Cosmetic effect is a great and beautiful thing, but if you should question the most intellectual and exalted gentleman in the world, he would say, 'Give me a little sight. Don't seek for anything else.'" Other details of technic and preoperative and postoperative care give one the impression of an exceptionally careful surgeon, considerate above everything else of his responsibility to his patients.

S. R. GIFFORD.

THE IMPORTANCE OF SLIT-LAMP EXAMINATIONS FOR THE PROGNOSIS IN CATARACT EXTRACTION. BUECKLERS, Klin. Monatsbl. f. Augenh. **87:** 527 (Oct.) 1931.

Hess, Elschnig and others have pointed out that a so-called mature cataract, that is, a cataract extending directly to the capsule, is not the most favorable for good surgical results today. Examination with the slit-lamp furnishes reliable information as to the size of the nucleus and the consistency of the cortex; it also allows conclusions as to the capsule: whether it may be grasped by the forceps or will evade it, or whether it promises to tear during delivery. Extensively sclerosed and relatively transparent lenses, with a posterior shell-like opacity and a scant portion of the cortex remaining clear, promise especially good results. Cortical remnants of radial opacities will absorb slowly, and remaining cortical masses in sclerosis of the embryonic nucleus still more slowly. The apparently favorable prognosis in so-called mature cataract may be explained by the fact that the removal of soft, opaque cortical masses can be more readily controlled during operation. The slit-lamp shows that divers forms of cataracts exist which may be distinguished by their structure, consistency and color; their character-

istic development and extension are indicative of the proper time, the course and the result of the operation.

K. L. STOLL.

Neurology

SOFTENING OF THE CALCARINE REGION IN A CASE OF HOMONYMOUS HEMIANOPIA. H. VILLARD and C. DEJEAN, Arch. Soc. d. sc. méd. et biol. de Montpellier **13:** 287, 1932.

Following a severe grippal attack, a man, aged 63, complained of tinnitus, severe occipital and left temporal headache and increasing difficulty in seeing on the right side. Examination disclosed right hemianopia with normal central vision. Roentgenograms revealed no anomalies in the occipital region, but disclosed extreme atrophy in the walls of the sella. A mild left adiadokokinesis was present. The patient died, a month later, of a heart attack; necropsy demonstrated a yellow softening of the lips and base of the left calcarine fissure, extending below to the lingual lobe, with the meninges very adherent. The topograpic situation indicated an obstruction to the calcarine artery. The occipital pole escaped involvement, since it is the terminal territory of two other arteries: the posterior temporo-occipital and the cuneal.

J. E. LEBENSOHN.

Orbit, Eyeball and Accessory Sinuses

SO-CALLED SPONTANEOUS PANOPHTHALMIA. O. HEINONEN, Finska läk.-sällsk. handl. **74:** 360 (April) 1932.

Heinonen reports that in a woman, aged 30, with a severe cold, a comparatively slight, transient pneumococcic infection occurred; at the same time menstruation set in. On the second day, when the fever was receding, a metastatic retinitis appeared, and in a few days panophthalmia developed. Evisceration of the eye was followed by uneventful recovery. Microscopic examination of the exudate showed pneumococci in pure culture. The author thinks that the portal of entrance for the pneumococcic infection in the blood was the upper respiratory passages, with the premenstrual constriction of the capillaries probably a disposing factor for the appearance of the infectious embolus in the retina.

EDITOR'S ABSTRACT. [J. A. M. A.]

Physiology

VESTIBULO-OCULAR REFLEX PATHS. L. PATON, Brit. J. Ophth. **16:** 267 (May) 1932.

The aim of the paper is to describe the anatomic paths by which the labyrinth is able to establish the controls of the structures of the eyeball. Beyond acoustic function and the ocular controls, the labyrinth has control over the muscle tone of the whole body, and on these controls depends the preservation of the body equilibrium.

The text is elucidated by seven diagrams in several colors to illustrate the paths. The article does not lend itself to abstracting.

W. ZENTMAYER.

THE DEXTROSE CONTENT OF VITREOUS IN THE HUMAN EYE. A. MAGITOT and A. LENOIR, Compt. rend. Soc. de biol. **110:** 1251 (Aug. 12) 1932.

The dextrose content of the aqueous approaches that of the blood, but that of the vitreous is less, and according to the researches of F. Adler on the cat, the peripheral vitreous has a lower dextrose content than its central portion, owing to the glycolytic action of the retina. Essentially the same findings were obtained in the analyses of the following human eyes studied: In a man, aged 72, a normal eye was removed under local anesthesia because of an orbital tumor. The dextrose content of the blood was 95.8 mg. per hundred cubic centimeters; that of the central vitreous, 74.4 mg., and that of the peripheral vitreous, 68.8 mg. The other eye of the patient was removed while he was in coma. The dextrose content of the blood was 108 mg.; that of the vitreous adjacent to the lens, 78.1 mg.; that of the central vitreous, 41.3 mg., and that of the peripheral vitreous, 51.6 mg. Another patient, a man, aged 38, had optic atrophy. The dextrose content of the blood was 93.4 mg.; that of the aqueous, 85.5 mg., and that of the vitreous a mixture of central and peripheral vitreous (obtained by suction), 74.7 mg.

J. E. LEBENSOHN.

IMPORTANCE OF INTRA-OCULAR TENSION FOR THE HEALTHY AND THE DISEASED EYE. R. SONDERMANN, Klin. Monatsbl. f. Augenh. **87:** 450 (Oct.) 1931.

A knowledge of the cause of the varying pressure in the veins and arteries is necessary for obtaining correct opinions regarding the advantages and disadvantages of higher or lower pressure on their walls. A knowledge of the origin of normal intra-ocular tension is equally essential. After discussing the theories of Leber, Starling, Hertel, Baurmann and others, the author declares that evolution alone can furnish the key. Examinations of the eyes of about 150 fetuses convinced Sondermann that the blood vessels have a predominating function in the development of the eye and its tension, which is physiologically higher than that of any other tissue of the body. The veins have to form their passage through the sclera at a time when the afferent arteries are still free from any pressure from the surrounding tissues. This condition is of importance for the formation of the globe itself and for the genesis of intra-ocular pressure, which originates from a stasis in the venae vorticosae, the chief factor in the development of the eye, and hence an impediment to the relief of pathologic conditions of the eye, as compared with other organs possessing an unimpaired and free circulation. This is the explanation why increased intra-ocular tension causes retarded recovery in corneal ulcers, not to mention glaucoma. A systematic decrease of intra-ocular tension should, therefore, be practiced more widely, e. g., in trephining for serpiginous ulcers. Wessely and zur Nedden consider paracentesis the most successful means of hyperemization. The retina, which takes no part in the passive venous hyperemia, receives only indirect benefit from a puncture of the anterior chamber. The intra-ocular pressure, necessary for the physiologic function of the eye, offers the most favorable basis for the maintenance of the health of the eye and

for its recovery in disease. This view is strengthened by the fact that intra-ocular pressure is derived from a venous stasis in the choroidal system; it is supported, furthermore, by the experience that diseases of the eye are beneficially influenced by a decrease of the tension in cases in which the anterior chamber is abolished. This happens because lowering of the tension produces hyperemia in the iris and ciliary body and increases the circulation of blood in the whole eye. Even a slight increase of the tension causes marked decrease of the circulation in the eye, and therefore should receive still more consideration than it has heretofore.

K. L. STOLL.

Refraction and Accommodation

THE RELATION OF THE BASAL METABOLIC RATE TO PROGRESSIVE AXIAL MYOPIA. L. BOTHMAN, Am. J. Ophth. **14:** 918 (Sept.) 1931.

The author discusses the possibility of myopia being due to disturbance of the internal secretions. Thirty cases were studied in which myopia increased at least 0.5 diopter in one year. These patients ranged in age from 6 to 20 years, the average age being 10½. Thyroid extract was given until the basal metabolic rate stayed between +5 and +10, and within a year refraction was again performed under atropine. The following conclusions are given: 1. This is the first series of cases of progressive myopia in which a study of the basal metabolic rate has been made. 2. The rates in this series are uniformly low. 3. Since a low basal metabolic rate indicates hypofunction of the thyroid gland, one may assume that, possibly, there is some relation between reduced internal secretion of the thyroid gland and progressive myopia. The fact that some cases ceased to progress after thyroid extract was taken and that others which were no longer progressive had a positive basal rate seems to substantiate this view. 4. The author does not claim to have brought to light the sole cause of myopia. His intent is merely to place these facts on record to interest other observers in deciding more quickly the merit of the assumption that hypothyroidism is a factor in causing progressive axial myopia.

W. S. REESE.

PROGRESSIVE MYOPIA: A SUGGESTION EXPLAINING ITS CAUSATION, AND FOR ITS TREATMENT. J. P. S. WALKER, Brit. J. Ophth. **16:** 485 (Aug.) 1932.

The author's idea that progressive myopia might be a "deficiency" symptom was strengthened by Schurr's suggestion "that there were very good grounds for believing that the cause of myopia might be found in a consideration of aberration of growth in children."

In myopia the globe of the eye is elongated, and in progressive myopia this elongation presumably increases. The sclera, therefore, must be stretching. As there is no hint of increased tension within the globe, it follows that the sclera cannot be as tough and resistant to expansion as in the normal eye, and that this "weakness" must be evenly distributed throughout. If, therefore, one can demonstrate that in myopia the sclera is weakened, this is a link in the chain to explain the elongation

of the globe in myopia. In spite of the correction of the abnormal relation of accommodation to convergence by full correction of the myopia, the myopia increases in many cases. Progressive myopia, therefore, must be influenced by some more general condition.

Progression is mostly to be found during adolescence, which is a period of stress to the child, who is growing rapidly and whose internal secretions are undergoing changes. In the majority of cases progression appears to stop spontaneously when adolescence ceases in the early twenties. In a great number of cases there is an aberration of growth of the body. In some of the patients under the author's care, dental caries was present, said by the dentist to be due to calcium deficiency. This statement, taken together with the increase in the length of the bones due to growth, led to the thought that progressive myopia may be a symptom of calcium deficiency. On this basis the author began, three years ago, the administration of calcium along with the correction of the refractive error. The results have been both suggestive and promising.

The author states that D. J. Wood (*Brit. J. Ophth.* **11:** 224 [May] 1927) made the same suggestion regarding the relation between myopia and calcium deficiency, and pointed out the necessity of prescribing parathyroid extract with the calcium.

W. ZENTMAYER.

AN INVESTIGATION OF THE RELATION BETWEEN THE DEVELOPMENT OF PRESBYOPIA AND THE DURATION OF LIFE. H. STEINHAUS, Arch. f. Augenh. **105:** 731, 1932.

This article attempts to confirm the thesis of Bernstein and Heidemann (dissertation, University of Göttingen) that some relation exists between the development of presbyopia and the normal expectancy of life. The original article must be consulted for the methods of obtaining the statistical data.

The author concludes that there exists a definite relation between the degree of presbyopia in man and his life expectancy. The degree of sclerosis of the lens is a fairly good measure of the aging process in vital organs, and therefore a good index of his life expectancy.

F. H. ADLER.

Retina and Optic Nerve

DIABETIC RETINITIS. ALEJANDRO CARRETON and CARLOS CAMINO, Arch. de oftal. hispano-am. **32:** 185 (April) 1932.

This paper is based on the study of 137 diabetic patients observed during the last eight years. Eighty-five presented vascular lesions, 32 retinitis, 5 nephrosclerosis and 4 syphilis. They were between 40 and 70 years of age, the majority between 45 and 55. The retinitis of diabetes depends exclusively on the vascular and sclerotic lesions which complicate this disease and is therefore to be found only in old cases and has no significance in connection with the severity of the existing diabetes, the process depending on the hypertension accompanying the vascular complications.

C. E. FINLAY.

ALBUMINURIC RETINITIS AND THE POLYPEPTIDE INDEX. H. VILLARD, C. DEJEAN and M. CAZALS, Arch. Soc. d. sc. méd. et biol. de Montpellier **13:** 329, 1932.

The polypeptide index of the blood apparently gives a truer picture of the degree of uremic intoxication than does the estimation of total blood nitrogen. Though normally the polypeptide value is but 2 mg. per hundred cubic centimeters, in fatal uremia it reaches from 20 to 30 mg. Puech and Cristol reported a case of albuminuric retinitis, with a normal blood nitrogen, but with an increased polypeptide index. The present authors describe a similar finding. The patient, a man, aged 50, vision R. 20/100, L. 20/70, blood pressure 260 systolic, with albuminuric retinitis had a normal blood nitrogen and creatinine, but the polypeptide index was 7.4 mg. Systemic treatment was instituted, and after five months the visual acuity improved to 20/20 in each eye.

J. E. LEBENSOHN.

RETROBULBAR NEURITIS FROM APIOL POISONING. A. JUHÁSZ-SCHÄFFER, Klin. Wchnschr. **11:** 1232 (July 16) 1932.

A case is reported of a 19 year old girl who took about twenty capsules of apiol, a stearopten, in twenty-four hours. Apiol is well known in Europe as an emmenagogue. Previous poisonous effects have been reported in the literature from this drug, but the lesions have presented a picture of polyneuritis, especially of the lower extremities. It is thought that the poisoning is due to tri-ortho-cresyl-phosphoric acid, which is included in the capsule. Following the taking of the drug the menses occurred and undiagnosed dermatitis was found. Two months later when the menses did not take place, the girl took more apiol, but not as much as on the first occasion. Some time later the left eye became blind and protruded slightly, and there was much pain. The power of adduction was limited. The right visual field was normal, and vision 2.0. The left eye had an absolute paracentral scotoma for a 5 mm. object, and a central-paracentral partial scotoma for blue, red and green, with vision of 0.6. After a sweat cure of three weeks the vision returned to normal. A bibliography is furnished.

L. L. MAYER.

Trachoma

MASSAGE WITH A BISMUTH OXYIODIDE GALLATE AS ONE OF THE METHODS OF TRACHOMA THERAPY. L. D. MITZKEVITZ, Sov. vest. Ophth. **1:** 155 (April) 1932.

The author considers massage of the trachomatous conjunctiva with airol, a bismuth oxyiodide gallate, to be important because of its antiseptic and antimycotic action on the process. The blood and lymph circulation is also being improved thereby. The author has applied this method alone or in combination with the usual treatment on a number of trachomatous patients since 1926. The best results were obtained in the recurrence of follicles in cicatricial trachoma and after expressions. This treatment is not contraindicated in corneal ulcer. The powder is put on the exposed conjunctiva, which is rubbed vigorously so that all parts are in contact with the powder. The conjunctival sac is syringed in a few minutes. The treatment is painless, and even children stand it

well. The substance disintegrates during the massage and produces a necrotizing effect on the follicles and the infiltration focuses; these degenerate and are subsequently substituted by connective tissue.

O. SITCHEVSKA.

Tumors

TWO CASES OF PALPEBRAL GRANULOMA. A. RIFAT, Ann. d'ocul. **169:** 198 (March) 1932.

In two cases, that of a boy of 15 years, and that of his cousin, aged 10, the symptoms and course were identical. In the first patient there were multiple tumors and three of the eyelids as well as the cheeks were affected. The duration of the disease was eight years for the right and seven years for the left eye. In the second case, only one lid was affected, and the duration was five years. The tumors developed slowly and without any acute inflammatory reaction. These subjects did not show any signs of syphilis or tuberculosis, or any other infection clinically. The lymphatic glands were normal. In the first case there were changes of moderate degree in the white and red blood cells, in their number and in their biologic properties. The number of white cells slowly increased, while the polymorphonuclears and eosinophils were little different from normal. There was marked anemia—3,000,000 red cells with parallel diminution of hemoglobin. In the second case the white cells were only slightly increased.

At operation encysted tumors were found forming white masses, and enclosing numerous nodules of different sizes. They were adherent to the skin at different points, and in the first case there was extension from the inferior lid to the orbit. The tumors were formed of lymphocytes, plasmocytes and large cells of clear protoplasm and inflammatory conjunctival element. These cases differ from those that McAll observed in central China. In the latter the subconjunctival granuloma generally settled near the internal canthi, the masses developed in front of the globe and made deep cavities in the lids resembling the conjunctival cul-desac, and the lids progressively increased in size until there was mechanical occlusion of the palpebral fissure.

It is impossible to establish the nature of these lesions, which are probably infections.

S. H. MCKEE.

CHOLESTEATOMA OF THE ORBIT. D. MICHAIL, Arch. d'opht. **48:** 743 (Nov.) 1931.

Because of the extreme rarity of cholesteatoma in the region of the eye, the author reports a personal observation and reviews the cases already reported in the literature. The case reported occurred in a boy, 9 years old, whose parents had noticed a painless mass situated close to the right supra-orbital ridge at the end of the eyebrow when the infant was less than 1 year of age. This tumor grew slowly, producing an exophthalmos of 5 mm., the eye deviating down and inward. It had so eroded the frontal bone as to produce a bony bridge at the temporal end of the supra-orbital ridge. Extirpation resulted in the production of a fistula which persisted until the bony bridge was cleaned away at a second operation. The tumor mass was found definitely sub-

periosteal at operation, and histologic examination showed the tumor to be a cyst lined with epithelium analogous to skin and its contents to be the result of proliferation of the epidermal lining. Four other cases have been described in the literature. The case reported by Rohmer and that of Gosselin described by Demarquay do not belong to this group of tumors, according to the author. This leaves only the two cases reported by Schirmer and Birch-Hirschfeld of undoubted cholesteatoma. The author's case differs from these two in its site. The pathology of these tumors is still open to question, some authors believing them to be congenital tumors of ectodermal origin, while others are of the opinion that they are due to inflammation secondary to trauma.

Two facts observed in his case led the author to favor the congenital origin. The first is the appearance of the tumor in the first year of life; the second, the presence of a hyperopic astigmatism in an amblyopic eye.

S. B. MARLOW.

PRIMARY ORBITAL ADENOCARCINOMA. AMADEO NATALE, Arch. de oftal. de Buenos Aires **6:** 655 (Nov.) 1931.

A case of tumor in the supero-external portion of the orbit is reported, which was successfully removed. The anatomicopathologic examination revealed it to be an adenocarcinoma, which the author considers primary. The operation was followed by applications of the roentgen rays.

C. E. FINLAY.

Uvea

"SMALLEST" SARCOMAS OF THE CHOROID. E. HEINSIUS, Arch. f. Ophth. **127:** 458, 1931.

The author gives a list of all the cases of smallest choroidal sarcomas which were found accidentally in eyes enucleated for reasons other than intra-ocular malignancy (fifteen cases) and also a list of the smallest choroidal sarcomas which were diagnosed clinically. To those the author adds one case, that of a man, aged 44, in which a sarcoma located at the posterior pole (6 by 2 mm. in size) was diagnosed clinically. The sarcomas of the last group are larger as an average than those found accidentally in enucleated eyes. In each group occurred every possible variety from an unpigmented to a heavily pigmented tumor. A few eyes contained a small sarcoma and also a benign melanoma. Still it is impossible to say what pathogenic relation there is between those two tumors. The author also confirms the findings of spreading of the tumor by means of the blood vessels and lymph vessels in a very early stage of development which necessitates the assumption of an acquired immunity of the body to very small metastases.

P. C. KRONFELD.

ANATOMIC AND CLINICAL OBSERVATIONS OF KOEPPE'S NODULES OF THE PUPILLARY SEAM IN IRIDOCYCLITIS: REPORT OF CASES. A. BUSACCA, Klin. Monatsbl. f. Augenh. **88:** 14 (Jan.) 1932.

Pathologico-anatomic observations of Koeppe's nodules of the pupillary seam have been reported only by Vogt and by Derby. A description and critical considerations of a third case are given by

Busacca, and a fourth case is reported. The right eye of a woman, aged 63, was inflamed for a month prior to her admission to the hospital. Numerous nodules of varying size had been observed at the pupillary seam, most of them isolated; some of them were gray and others pigmented on their surface. So-called "snowflakes," observed in iridocyclitis by Busacca and other authors, were not present. Melanosarcoma of the choroid was detected after dissolution of the posterior synechiae, and the eye was enucleated. Pathologic examination, described in detail and illustrated, revealed nodules in the ectodermal and uveal layers, involving both. Busacca distinguishes two types: (1) the nodules (Koeppe's nodules) which form on the ectodermal layer of the iris and which may penetrate into the uveal layer at a later stage; (2) the "floccules," which are round formations on the mesodermal layer of the iris or occasionally on the nodules; they are formed by an exudation derived from the tissue of the iris and from small bodies found in the aqueous humor and deposited on small areas of the iris, where they cause ulcerations. The floccules absorb quickly, sometimes within a few days, while the absorption of the nodules may consume considerable time, often weeks. The white floccules do not represent a syphilitic type, as stated by Vogt. The floccules dissolve completely, while the nodules result in a discontinuation of the pigmented seam. Both types were evident in a case of iridocyclitis in a woman, aged 24, suffering from acute tuberculosis and syphilis. The size of the nodules varied according to the exacerbation or improvement of the general disease. The development of floccules on the nodules increased the size of the latter as quickly as their rapid absorption reduced it again. Nodules arising at a certain stage of the disease in this case penetrated the entire thickness of the iris, with preservation of its surface; these nodules, in Busacca's mind, are identical with the tuberculids observed by Gilbert in some cases of iridocyclitis, or with Koeppe's *"Kuppeln"* of the seam of the iris.

In another case of iridocyclitis, in a syphilitic man aged 43, nodules of the pupillary seam of the iris were noticed from the very beginning. They increased in size, even while the recovery progressed, but disappeared after three months, leaving an interruption of the pigmented seam of the iris.

The nodules possess no etiologic value because they appear in cases of syphilis, tuberculosis and disorders of metabolism. Eosinophilia was the only general symptom present in some cases. The development of the nodules is of prognostic value, since it indicates that the iridocyclitis may never completely heal but may recur after apparent recovery. The floccules may indicate that a form of iridocyclitis is present, in which ulcerations will not occur.

K. L. STOLL.

Sympathetic Ophthalmia

THE CURE OF BILATERAL SYMPATHETIC OPHTHALMIA. L. DOR, Arch. d'opht. **48:** 811 (Dec.) 1931.

Prophylactic and therapeutic enucleation is so generally practiced in the treatment of sympathetic ophthalmia that it is difficult to determine in what proportion both eyes are cured when affected by this disease.

Moreover, reports of cure to both eyes are extremely uncommon for the same reason. The author has reviewed the literature and found in it reports of fifteen cases prior to 1914 and only two cases since, one of these being his own case, reported in 1919, the other that of Caldero, reported in 1928. He asks if this contrast means that enucleation has gained ground and become a fixed procedure. It is justified by the uncertainty of the prognosis of the disease. Nevertheless, reports of cures are increasing, and a rational treatment is developing. It is interesting to read the reports in which a single therapeutic measure has been resorted to. He believes that treatment should include subconjunctival injections, fixation abscesses and internal treatment varying with the case if one is to be convinced there is a possibility of both eyes being cured. He reports a case, seen by several ophthalmologists, in which he advised against operation and in which the outcome was successful. He believes that in the presence of sympathetic ophthalmia enucleation should not be done if the injured eye retains any vision. On the contrary, the effort to save both eyes should be made. There is no doubt that enucleation performed immediately after the accident has definite prophylactic value, but when it is done two weeks later it is too late. Enucleation, he believes, has no curative action when sympathetic disease is established and should only be done in those cases in which it is obvious that a painful, useless eye will remain.

S. B. MARLOW.

SYMPATHETIC OPHTHALMIA. A. FUCHS, Arch. de oftal. de Buenos Aires **7**: 67 (Feb.) 1932.

This is an extensive paper comprising the most up to date problems relating to sympathetic ophthalmia as regards its frequency, characteristic symptomatology, the time elapsed between injury and appearance of sympathetic ophthalmia, injuries most apt to produce it, pathologic anatomy with differential diagnosis from miliary tuberculosis, globular tuberculosis, diffuse tubercles and necrosing tuberculosis and theories of transmission and pathogenesis with report of a precocious case.

In connection with its frequency, the high proportion of postoperative cases (31 per cent) to be found in Fuchs' and his father's collection is worthy of note. The lesions that he finds most apt to produce sympathetic ophthalmia are: (1) eyes that after injury or operation do not heal promptly, remaining congested and irritable, finally going on to bulbar atrophy; (2) scleral ruptures; (3) eyes in which inflammation following contusions does not readily mend; (4) phthisical eyes after injury which, after remaining quiescent for years, become once more painful and irritable, and (5) phthisical eyes following perforation of ulcers or after injury.

In relation to the pathologic lesions, attention is called to the classic lesions found by Ernest Fuchs: (1) primary nodular efflorescence, composed of lymphocytes with some epithelioid cells and (2) localization of these in the uvea. In the iris these are to be found principally in the posterior layers with destruction of the pigment layer, and in the ciliary body in the vascular layer with a similar destruction of the pigment layer; the choroid is transformed into a thick membrane with few vessels frequently collapsed, with hyaline degeneration and fusion of the

lamina vitrea with the pigment layer. These lesions are rarely found alone, being, as a rule, complicated with the lesions following the original traumatism: septic endophthalmitis, postendophthalmitic phthisis, panophthalmitis (very rare), serous iritis, phthisis following endo-ocular hemorrhage or severe tissue destruction. As regards the pathogenesis, after mention of Mackensie's, Mueller's, Berlin's, Leber's and Deutschmann's theories, the author refers to Roemer's metastatic theory, to Guillery's toxin theory, to Elschnig's anaphylactic theory and to von Szily's theory. The author, who has experimented much in this relation, was somewhat inclined toward the anaphylactic theory but has been obliged to abandon it. The difficulties in the solution of this problem depend on the failure to produce sympathetic ophthalmia experimentally in animals and on similarity of the lesions found in certain inflammations in the eyes of animals with those found in human sympathetic ophthalmia. Lacking a proper animal for experimentation, one has to limit oneself to the study of precocious cases, one of which the author reports. This case occurred in a man, 62 years of age, with a scleral wound, in whom the eye was enucleated six days after the injury. Seven and one-half months later the patient returned with an iritis and a history of inflammation for one month previously after several months' congestion. No other cause could be discovered. The iritis was cured, and there was no recurrence in eighteen months. Examination of the exciting eye revealed: rupture and prolapse of the iris and ciliary body, rupture of the lens capsule and an abscess between the ciliary body and the lens (ex necrosis of ciliary processes); the vitreous was full of blood, the retina was in situ, the choroid and ciliary body were detached by a severe hemorrhage, and there were lymphocytic foci in the choroid along the blood vessels. After reference to the findings in a case of his father's, in which the eye was enucleated five days after injury, the author concludes that in these cases the virus seems to enter the blood stream through the choroid vessels, finding an appropriate soil for development in the other eye.

As regards treatment, the author recommends pyretotherapy energetically applied commencing with antityphoid vaccination and resorting, if necessary, to malarial inoculation.

C. E. FINLAY.

Therapeutics

THE USE OF THE FEMALE HORMONE IN RETINITIS PIGMENTOSA. F. WIBAUT, Deutsche med. Wchnschr. **57:** 1739 (Oct. 9) 1931.

It is well known that retinitis pigmentosa occurs more often in the male than in the female, and is usually more severe in the male. Because the condition is recognized as a sex-linked hereditary disease carried through the female sex chromosome to the male offspring, the author had the thought that in these males the sex hormone contributed by the mother might be the missing and causative factor of retinitis pigmentosa. Other facts that influenced this view were the origin of the retinitis at puberty and its failure of progress after the usual age of the menopause. The author began this work in 1927, but because he used small doses, no results were obtained, even in the same cases that showed improvement later with larger doses. Improvement was based

on enlargement of the peripheral visual fields, enhancement of the light sense, as shown by Tscherning's glasses, and greater range of light adaptation, as shown by quicker recognition of smaller test objects. The dosage of female hormone recommended and used by the author is a single injection each week for four weeks of 40 mouse units. The author concludes that of the five patients treated, one was greatly improved, two were moderately improved, one was slightly improved and one with a very old case was unimproved. This investigation is being continued.

L. L. MAYER.

DIATHERMY TREATMENT OF THE EYE. G. ERLANGER and A. ERLANGER, Deutsche med. Wchnschr. **57:** 1896 (Nov. 6) 1931.

The authors believe that the use of diathermy in treatment of ocular conditions has lagged because of the question of dosage. They recommend a beginning application from fifteen to twenty minutes, which later may be increased to one-half hour. The current should be regulated *carefully* to each person's sensibility. Activity may be augmented by iontophoreses with 0.25 per cent calcium chloride, a few drops of 1 : 1,000 epinephrine hydrochloride and 1 : 10,000 histamine used for one and a half minutes with a current of 1 milliampere. One electrode is placed at the back of the neck, the other over the eye. Both are soaked with 1 per cent sodium chloride. After treatment, a healthy ciliary injection is noted which quickly subsides; also, the cornea may show a temporary clouding. At times a Horner's syndrome occurs, and the fundus shows engorgement of the vessels. Three patients with paralysis of the muscles were treated in this way with excellent results. Other cases reported are of retrobulbar neuritis, retinochoroiditis, chorioretinitis disseminata, arteriosclerosis and diabetes of the retina and traumatic chorioretinitis. Treatment of high myopia will be reported in another paper. Reference is made to diathermy treatment of the atrophy in glaucoma by Wellisch and Loffler. It is believed that the increased hyperemia produced at the posterior position of the globe is responsible for the good effects. A bibliography accompanies the article.

L. L. MAYER.

CURATIVE FACTORS AND RESULTS IN OCULAR TUBERCULOSIS. E. WERDENBERG, Klin. Monatsbl. f. Augenh. **87:** 1 (July) 1931.

Therapeutic results depend on a correct diagnosis of the character of the tuberculosis of the eye and that of the body. It is essential to recognize the compensation of the disease, i. e., the correlation between infection and resistibility in each case. Tuberculous uveitis, for instance, occurs both in a predominatingly compensated, benign type and in a predominatingly uncompensated, malign type. Tuberculin therapy is almost altogether contraindicated in the second type. The diagnosis of these two types of tuberculosis, as found in the body, depends on the condition of the hilus glands in the thorax and that of the lungs, furthermore, on the toxic symptoms, reaction of immunization, blood settlement, loss of weight and other disturbances of the general system.

Werdenberg discusses these three valuable curative factors in the treatment of tuberculous eyes: alpine climate, roentgen rays and tuberculin, and subconjunctival injections of sodium chloride. The author supplies his statistics on therapeutic results obtained in 366 tuberculous eyes of 230 patients, many of them severe and unfavorable cases of long duration. The average previous treatment of the patients had lasted from two to three years, while only an average of four and a half months was required for their treatment and final cure at Davos. Useful vision was recovered for seventy patients whose eyes were nearly blind on admission to the hospital; forty-eight eyes obtained a vision of from one half of the normal to full vision.

The author considers general care of the organism and alpine climate as the chief therapeutic factors.

K. L. STOLL.

THE EFFECT OF CAUTERIZATION ON REGENERATION. K. VOM HOFE, Klin. Monatsbl. f. Augenh. **87:** 191 (Aug.) 1931.

The author discusses whether the bactericidal action of cauterization or its resulting decomposition of blood and tissues produces recovery. He doubts whether similar decomposition, rather than operative procedures, is the cause of recovery in so-called rhinogenous retrobulbar neuritis, or iritis, after the opening of nasal cavities which frequently are found free from infection, or after extraction of teeth. He refers to the observation that prompted the contention of A. Bier that decay of tissues of the human body plays an important rôle in every process of immunization. Bier and A. K. Erb obtained results in phlegmon and in general septic infections by cauterizing the muscle tissue beneath the intact skin. Vom Hofe reports his experiments based on these considerations. Four patients with disciform keratitis were treated in the following manner: The conjunctiva was detached several millimeters from the limbus; the subconjunctival tissue was then singed with a faintly red cautery, after which the conjunctiva was refastened with sutures. Recovery followed swiftly in two cases and slowly in one, but failed to occur in a fourth case. The result was less evident in a number of rabbits in which the epithelium of the cornea was removed by abrasion, with subsequent subconjunctival cauterization. The regeneration of the corneal epithelium was controlled with fluorescein. In another group of rabbits the cornea was cauterized at from two to six places, after previous abrasion, and a round piece of corneal epithelium was removed with a trephine. In a third group the center of the defect was cauterized. Regeneration in all groups followed more promptly in eyes that were cauterized. The heat, applied slightly and for only one second or less, could have had but a partial effect in these experiments. The result, therefore, was attributed to the effect of the destroyed tissues.

K. L. STOLL.

ROENTGENOTHERAPY IN TUBERCULOUS CHOROIDITIS. A. J. ODNASHEVA and V. J. JUSTCHENKO, Russk. j. opth. **13:** 484 (May-June) 1931.

The authors treated three patients with choroiditis of tuberculous origin with the roentgen rays. In one case of a woman, aged 20, who suffered from a large exudate of the macular region with a central

scotoma, four treatments were given every seven days. At the end of the fifth week the exudate was hardly visible, the scotoma had nearly disappeared and the vision was improved from 0.01 to 0.15. The second patient suffered from a disseminate choroiditis. The vision was improved from 0.1 to 0.6 in the right eye and from 0.05 to 0.2 in the left eye after four roentgenologic treatments. The third patient presented an acute tuberculous condition of the choroid with fresh inflammatory exudates appearing during the treatment. After the third treatment, an optic neuritis with more fresh exudates was recorded, owing to which the authors were forced to discontinue the treatment.

The authors review the literature and discuss the dosage and the frequency of roentgen therapy. They recommend the application of small doses, with infrequent intervals between each treatment and also between the series of treatments, particularly in acute cases.

O. SITCHEVSKA.

Toxic Amblyopia

RETROBULBAR NEURITIS DUE TO THALLIUM POISONING. W. I. LILLIE and H. L. PARKER, J.A.M.A. **98:** 1347 (April 16) 1932.

Two cases of retrobulbar neuritis due to thallium, used in the form of Koremlu cream, are reported. Both occurred in women, aged respectively 30 and 27 years. The defect in the fields in the first case consisted for the right eye of an absolute central scotoma and moderate contraction for form and color, and for the left eye of an absolute cecocentral scotoma, breaking through into the nasal field. There was no perception of colors on concentric contraction of the form field.

In the second case there was an absolute central scotoma in the field of each eye, with no perception of green by the right eye.

W. ZENTMAYER.

Society Transactions

EDITED BY JOHN HERBERT WAITE

GERMAN OPHTHALMOLOGICAL SOCIETY

PROF F. POOS, MÜNSTER, *Reporter*

Forty-Ninth Meeting, Leipzig, May 19-21, 1932

ABRIDGED TRANSLATION BY PERCY FRIDENBERG, M.D., NEW YORK
(Klin. Monatsbl. f. Augenh., June, 1932)

GOETHE'S SIGNIFICANCE IN PHYSIOLOGIC OPTICS. DR. TSCHERMAK-SEYSENEGG, Prague, Czechoslovakia.

Dr. Tschermak-Seysenegg paid tribute to the great poet as the pioneer in subjectivistic physiology of the special senses, and stressed his evaluation of black and white as equivalent basic elements in vision, so that black, in spite of the absence of physical light, acquires a physiologic actuality which is always present in the ideo-gray of the closed eyes, and with local illumination in their vicinity is contrastively heightened. He also correctly foresaw the importance of contrast as a means of autocorrection (*Selbstretusche*) of the naturally ill defined retinal pictures, and it is to him that ophthalmologists owe a wealth of beautiful demonstrations for eliciting subjective contrast phenomena. In accordance with the data of a subjective sensory analysis he arranged the colors of the spectrum in a ring, but did not, as Hering did later, place the strictly complimentary colors, red-green and yellow-blue, opposite each other, but paired purple-green, orange-blue and yellow-violet. He made the significant determination that, like pure red, the purple tones are not present in the spectrum and can be produced only by mixing the colors from its two ends. The aforementioned three pairs of principal colors (*Hauptfarben*) he found to be mutually stimulating to contrast, especially in after-images, but this is strictly accurate only if there is a certain degree of change of pitch toward the red-blue, as is usual in the morning and evening. His elementary colors are carmine-red, yellow, and blue. Green, in spite of its subjective unity, he considered as a product of blue and yellow, misled by the painters' experience that a mixture of blue and yellow pigments produces green, or more correctly speaking leaves only green. He interpreted correctly, as a phenomenon of after-images, the lightning (*Blitzen*) of blossoms in the dusk, and so far back had pseudo-isochromatic equations made for him by color-blind subjects. It is true that he interpreted these cases incorrectly, as due to lack of blue-sensibility (*Akyanoblepsie*) instead of to red-green blindness. One must reject his view that colors are the product of variations in the spatial arrangement of light and darkness, as "six daughters of the wonderful pair, Day and Night," and must today admit

the independence of color and colorless sensibility. Goethe's conception of white as simple, i. e., noncomposite, was as correct from the standpoint of physiologic psychology as was Newton's from the physical point of view. Both made the mistake of carrying over their conclusions to the other field, that of physics and of physiology, respectively. The golden mean was pointed out by Hering. Today, the independence and unity of the white of twilight vision mediated by the rods are generally admitted (von Kries). For the cones, the three-component theory of Young-Helmholtz and Maxwell also claims a synthetic origin of day-white, while Hering, Tschermak and others consider that this, too, is independent of colors. In the field of optical space sense and ocular motility Goethe made valuable observations on double images in abduction of the previously occluded eye (exophoria) and the experiment of fixing two candles with false convergence and changing the positions gradually until the inner, not congruous (heteronymous) images fused, at the moment the angle of deviation coincided with the angle of aperture of the pair of candles. With this test he certainly gave proof of the stable sensory cooperation of the two eyes, which one speaks of today as binocular single vision. For all the progress and subsequent development beyond Goethe's standpoint, it is his everlasting merit to have sensed and encouraged the subjectivistic hypothesis.

I. Scientific Session

DR. ZEEMAN, AMSTERDAM, HOLLAND, *Presiding*

HAS THE EYE A CENTER OF ROTATION? DR. VAN DER HOEVE, Leiden, Holland.

This question has again become timely. The experiments of Schaap and Brennecke, which showed that there was no single point of rest, have been rejected as too inaccurate. Hartinger's investigations show that some persons have a single point or center of rotation, while in others the various ocular movements take place around centers which may be from 2.5 to more than 4 mm. apart. Nordenson and Verrijp have also furnished data from which one may deny definitely that every eye has a fixed center of rotation about 14 mm. back of the cornea. The eye probably tends to assume the required position in the easiest possible way and in doing so slides and rotates around those centers which are best suited to the purpose. This does not necessarily lower the practical value of correcting glasses constructed on the hypothesis of a single center of rotation, 14 mm. behind the summit of the corneal vertex. Experience shows that most people prefer them to, and find them more comfortable than, the bi-glasses, although it may take them some time to get used to them, while some can never get used to the Katral-glasses, especially the stronger ones. In these cases, probably, the theoretically assumed centers do not correspond to the actual rotations of the globe. The best glasses, then, are not those constructed for a single center of rotation, which does not exist, but are those constructed for a possibly theoretical center to which most eyes can soon, and with comfort, adapt themselves.

DISCUSSION

DR. HARTINGER, Jena: The question as to which center an eye rotates around when it makes minute changes in the line of fixation has been considered by Dr. van der Hoeve from the kinematic standpoint. It would, however, be fallacious to conclude from the fact of separately located rotational centers that the hypothesis of an optical center of rotation is an error. How little justification there is for drawing inferences from the position of temporary (*momentan*) centers of rotation is shown by the mere fact that the dispersion of these centers is, as a general proposition, the greater, the smaller the fixational angles are which are used as a basis of observation. If one considers the question from the optical standpoint, these kinematic investigations may be disregarded entirely, and the geometry of position is the only thing that counts. In other words, if the optical axes or the lines of fixation, respectively, intersect at approximately the same point with the different fixation positions of the eye, the optician is fully justified in assuming a center of rotation. Gullstrand, in a personal communication in 1928, expressed his conviction that there was no single center of rotation, but was equally sure that the intersections of the lines of fixation varied so little—generally less than 1 mm.—that in the construction of glasses and optical apparatus it is quite permissible and practical to assume a single center. This point of view is justified by Dr. van der Hoeve's painstaking and accurate investigations.

DR. NORDENSON, Stockholm, Sweden: I accept two centers of rotation, one optical and the other kinetic, which, theoretically, may each exist independently or may both be purely hypothetic (*Fiktionen*). Is the assumption of an optical rotation center admissible or not? The lines of fixation form a sheaf of rays which narrows down toward a point, and the significant question is whether this approximation to a point is smaller than the error which is always present when optical apparatus is adapted to the eye. The picture presented here would seem to indicate that it is. Further study of the optical side of this problem should proceed along the practical line of determination of visual acuity with various directions of gaze. These will probably show that, at least for eye glasses, the special (*durchgebogen*) lenses prove their worth, although one and the same curvature (*Durchbiegung*) may be satisfactory for a number of closely approximated dioptric values.

DR. FISCHER, Leipzig: The smaller the included fixational angle, the smaller is the constriction of the sheaf of light rays. In my series, six hundred subjects never changed the angle of fixation more than 12 degrees without movement of the head.

DR. TSCHERMAK-SEYSENEGG, Prague, Czechoslovakia: The practical importance of considering the terminal positions (*Endlagen*) in the problem of a rotation center should be stressed. An optical localization does not enter into practical consideration during the rotation, and the lines of fixation for terminal positions are closely approximated and homocentric. Vibrational oscillations of the rotation center in the orbit may be possible with a relatively fixed position in the globe. If one merely compares the terminal positions, the fixation movement seems to take place about a fixed center, from a primary to a secondary or tertiary position, moving around a fixed axis of rotation located in the

primary axial plane. Donders' and Listing's law applies in all essentials to an analogy with the orientation of the retina in the two terminal positions and the possibility of a smooth transition (*Ueberfuehrung*) of the eye by rotation about a fixed axis. This law is based on the continuous synergy of the vertically acting muscles in a constant relation, while it would be impossible to call into play the isolated action of any single one.

DR. VAN DER HOEVE: I note the general agreement as to the theoretical question of a rotational center, and as to the practical point that the terminal positions of the line of fixation after a movement are such that the line could have rotated about a point. But the points are not identical for different rotations. Hence, optical firms should put out glasses not for a single rotation center of, say, 14 mm., but for distances of 13, 14, 15 and 16 mm., so that one could have a set, as of contact glasses, to enable one to prescribe for the patient the glass that he finds most comfortable.

LOCALIZATION AND PATHOLOGY OF THE CORTICAL MACULA. DR. NIESSL VON MAYENDORFF, Leipzig.

Previous studies have been based on observations at autopsy in cases of bilateral hemianopia with the preservation of central vision, and have showed the most posterior portion of the area striata as the central, cortical, projection of sharpest sight (Lenz). In 1922, Roenne determined the location of the macular bundle which radiates in the external geniculate body, by valuable studies of secondary degeneration in a diabetic person. Zeeman and Brouwer confirmed these data by experimental destruction of the macular retina of an ape and by a follow-up of the ensuing secondary degeneration in the geniculate body. Dr. von Mayendorff studied serial sections in about a dozen cases of old foci of softening in the occipital lobe with reference to the conditions of cell formation in the external geniculate body and the structure of the medullary fibers. As he had demonstrated years ago, degenerative phenomena in the subcortical ganglions present a regular, segmentary character in contrast with similar processes in the cerebral cortex, so that the pathologic changes in the external geniculate body could be studied particularly well in cell preparations. Cases of destruction of the basal optic radiation or of the gyrus lingualis showed degeneration of the outer, rostral section (*Sporntheil*) of the external geniculate body. Lesions affecting the dorsal visual tract exclusively were followed by changes in the medial portion only of the external geniculate body. In a single case (Barth) degeneration of the elements had encroached on the central region of the geniculate body which corresponds (Roenne-Zeeman-Brouwer) to the irradiation zone of the macular bundle of the optic nerve. Groups of normal cells were found in the rostral portion and in the inner corner. Corresponding to this cell picture there was a picture of degeneration of the medullary fibers in the "rayon" of the lost ganglion cells. The softening in the right lingual gyrus, which extended into the cuneus as well, seems to have spread toward the rear and included the entire occipital pole. The patient had no hemianopia. This report was completed by its counterpart. In a case of right homonymous hemianopia with only transient alexia (Tschringer) a softening of the gyrus lingualis was found post mortem, with preservation of the

occipital pole. The structural picture of the external geniculate body showed a disappearance of the cells in the rostral portion, while the middle section and median half were occupied by normal or not significantly altered elements. These data support the view that the central projection of the macula is located in the occipital region. This determination has a certain significance in pathology in that in destruction of the left occipital pole, whether by disease or trauma, phenomena of visual asymbolism are noted. Of course, the same symptoms appear when there is a break in the left macular bundle which runs back toward the rear in the lateral sections (*Etagen*) of the strata sagittalia. This relation is quite regular and constant. In a histologic analysis of five cases of visual amnesia or word blindness (*Seelenblindheit*) Dr. von Mayendorff found either a lesion of the left occipital pole or one of the macular bundle connecting the macular zone of the geniculate body with the occipital pole or destruction from softening in the central portion of the external geniculate body. The clinical symptoms of loss of function (*Ausfalls-Symptome*), depending on an anatomic cutting off of the central macular system, are more easily understood if one bears in mind that the cortex of the right posterior pole is in connection with both retinal maculae so that no disturbance of central vision need follow. However, the optical impressions registering in the right hemisphere lack their accustomed associations with the left hemisphere of the cerebrum, the organ of thought and action.

DISCUSSION

Dr. M. H. Fischer, Berlin-Buch: Following up old observations with A. E. Kornmueller, one eye was illuminated in rabbits, cats, dogs and apes. It was possible to elicit characteristic action currents, from the cerebral cortex predominantly, of the opposite side and strictly confined to a definite cortical area. A subsequent check-up by architectonic histologic study showed it to be the area striata. These electrophysiologic surveys are extremely accurate (demonstration) and practicable through the dura or even through the bone of the skull. When light was thrown locally on the center of the retina as far as it was practicable (these experiments are to be carried on), it could be demonstrated that action currents appeared through the entire extent of the area striata, although apparently quantitative differences occurred. These experiments show that, at least in the animals tested, the macular fibers evidently radiate over the entire area striata, confirming an old point of view lately expressed again by Wilbrand.

Dr. Zeeman, Amsterdam, Holland: Dr. Zeeman referred to Dr. van der Hoeve's studies on the occipital cortex and the degenerations in the optic radiation and in the external geniculate body of apes. The relations between these two areas were accurately determined with an exact projection of the external geniculate body on the posterior pole and the cortical representation of the macula in a relatively large area of the posterior, external surface of the occipital pole.

Dr. von Mayendorff: I do not believe in the possibility of throwing light into the fundus in such a way as to cause an isolated illumination of the macula (Fischer) in animals whose central fovea plays a minor rôle in the act of seeing. On the contrary, there is undoubtedly

a diffusion of the light stimulus in the retina. The result must be that the entire field of the area striata is subjected to secondary stimulation, with the development of action currents at every point in the area. Accordingly, experiments with the latter cannot yield any decisive information as to the localization of the cortical macula.

STUDIES OF SUBJECTIVE VISUAL DISTANCE (SEHFERNE) AND AN EGOCENTRIC ESTIMATE OF SEPARATIONS. DR. FISCHER, Berlin-Buch.

A haploscopic arrangement was used, which presents at a definite distance from the eye of the observer two identical frontoparallel transparent diapositive plates with concentric black and white rings. A micrometer screw allows the distance between the centers of the images to be varied. If these images are fused haploscopically by binocular vision, the degree of convergence alters with the alteration of the spread of the image centers. The two-dimensional combination-image appears at a definite binocular egocentric distance, the *Sehferne*. In the apparent plane of this combination-image one can place, accurately, a black rod against a distant white background. This rod moves on a track which is in the sagittal plane of the observer. Its distance from the eye can be read off and the *Sehferne* thus indicated quantitatively. A graph of the findings shows that the curve of the *Sehferne* runs parallel to that of the convergence far points, so that the physiologic processes associated with convergence are directly connected with the *Sehferne*. The apparent size (*Sehgroesse*) of the combination-image is directly proportional to the subjectively conceived distance. Plus and minus lenses have no effect on the *Sehferne,* nor has accommodation. Prisms, base out, increase the *Sehferne;* prisms, base in, decrease it. The effect is the more marked, the smaller the primary angle of convergence, and the prism alters the convergence angle by a sixteenth of its strength in degrees. Studies with plane parallel (Rollets) plates gave similar data. The faculty of seeing the rod in the apparent plane of the combination-image depends on stereoscopic vision and depth perception. If the rod drops back of or goes before the plane of fusion (*Kernflaeche*) it appears in double images. The maximum angle of parallax or separation of images, however, remains constant with a varying *Sehferne,* but corresponds, according to the individual *Sehferne,* with very different values of the egocentric linear depth—or distance—sense (*Sehtiefe*). These two subjective judgments are closely allied. With equal angles of image separation (*Disparation*) the *Sehtiefe* increases directly with the *Sehferne*. On the basis of these observations, Dr. Fischer is skeptical as to the value of alleged monocular visual orientation for distance, unless one takes into consideration the so-called secondary factors of depth-perception.

RESEARCH ON THE STRUCTURE OF THE VITREOUS. DR. BAURMANN, Göttingen.

The first question relates to the visible "periodic" vitreous structures which appear in histologic sections to be built up on a basis similar to that of the orange or of the onion. Are they to be considered as actually preformed by the arrangement and ordering of ultramicroscopic threads?

Dr. Baurmann studied the vitreous systematically with the slit-lamp through two small scleral openings in pigs' eyes which were allowed to remain in situ. The numerous ultramicroscopic bird's-eye views or "shots" thus obtained were arranged in series, so that a large number of sagitttal optical sections of the vitreous were obtained. To these was added a series of frontal sections and one almost complete equatorial optical section built up from separate views. These failed to show any structure such as might have resulted from successive alterations in the density (*Packungsdichte*) of the vitreous or from a periodic arrangement of the course of the fibrils. The peripheral portions alone were found to be quite uniform, the axial region more "enlivened" and varied by the presence of wavy and curly structures. A true, well marked central vitreous canal was found, as opposed to the description of Ida Mann. It cannot be a question of a pseudo-canal simulated by a particularly loose structure of central vitreous areas. The moiré or shot silk effect which would result from a superposition or stratification of actual structural layers in the area of waves or curls was tested out by means of an adjustable micrometer slit which could be reduced to a slit-lamp image depth of less than 2 microns, i. e., less than the average distance between the fibrils. This failed to show any fundamental difference in the picture of these structures.

DISCUSSION

Dr. Comberg, Berlin: I doubt the correctness of Baurmann's claim that the vitreous has no lamellar structure. In every normal human eye the slit-lamp shows visible wavy planes or surfaces which, immediately behind the lens, course predominantly from above downward and diagonally backward and in the individual case always appear at the same spot. This certainly speaks in favor of a preformed delimitation of layers of some sort in the human vitreous. This lamellar structure is seen beautifully in cases of prolapse of the vitreous into the anterior chamber after injury or in the course of extraction of cataract, in which case blood may settle between the layers. The latter data, particularly, speak quite definitely and unmistakably against the possibility of a moiré effect.

Dr. Baurmann: The slit-lamp reveals a structural appearance, predominantly in the axial area. This depends not on actual membranes but on a summation effect caused by the similar course of the fibrils. In hernia of the vitreous mechanical deformation takes place, causing tension stresses within the substance which tend to arrange the fibrils in the line of pull. The latter then appear, under a favorable angle of illumination, more than usually brilliant.

Structure and Consistency of the Vitreous. Dr. von Buenau, Leipzig.

A marked difference was noted in the consistency of the vitreous in various animal species (ox, sheep, swine, dog, cat, rabbit and man). The vitreous of the ox is an almost solid, highly elastic gel which can be separated from the enveloping tissues of the eye without loss or change of consistency. To produce the well known phenomenon of surface tension resulting in stringiness (*Fadenziehen*), it has to be cut up

or mixed up (brayed) in a mortar, while the rabbit's vitreous is so fluid that it cannot be removed without loss of consistency and is thready (*spinnbar*) even while it is being dissected out. Quantitative studies of the stringiness showed a great variation in the length of the "threads," so that no figures for a norm can be given. This is not confirmed by the studies of Joachim on sputum, and of Aggazonni, Tocco and Tammann, whose material showed a definite length of thread. The vitreous disintegrates (*entmischt*) immediately on being removed from the eye; this allows the stringiness to appear, but at the same time variously alters the length of the threads. If left in situ, the vitreous does not draw threads, being protected from the mechanical factors and changes which make it susceptible to threading, tenacious (*spinnbar*).

NATURE OF CORNEAL PIGMENT DEPOSIT IN PSEUDOSCLEROSIS. DR. ROHRSCHNEIDER, Greifswald.

Histochemical tests with ammonium sulphide, potassium cyanide, compound solution of iodine and hydrochloric acid caused the pigment to disappear from microscopic sections of the cornea, confirming the findings of other writers; 2 per cent potassium hydroxide caused the pigment to disappear from eyes fixed for a short time in a diluted solution of formaldehyde (1:10), but after long fixation even an alcoholic solution of the potassium hydroxide had no effect. The pigment has marked similarity to malaria pigment and formaldehyde sediment but, unlike them, turns black on treatment with silver nitrate. The histochemical reactions, if valid, would justify one in attributing this pigment to the coloring matter of the blood, were it not that chemical analyses by Vogt and Karrar showed the presence of silver in an eye with pseudosclerosis. The histochemical data do not speak for or against silver as the source of the pigment. Further research may show that a hitherto unrecognized silver compound with malaria pigment may give the same reactions.

DISCUSSION

DR. FLEISCHER, Erlangen: The result of chemical analysis of one globe in Vogt's case is dubious, as the patient had been taking silver internally for a long time and may have had a medicinal argyrosis. The presence of silver salts, post mortem, in the viscera of patients dying of Wilson's disease may be due also to their having been treated with silver arsphenamine. Some showed a pigment ring in Descemet's membrane, also seen in pseudosclerosis, and some did not. These patients should have chemical blood tests for formaldehyde pigment.

DR. KUBIK, Prague, Czechoslovakia: Vogt's work on the chemical basis of Fleischer's pseudosclerosis ring merely clouds the issue, as he was dealing with a substance that was not chemically pure, viz., a pigment contaminated by silver. This is borne out by the nickname of his patient, "blue Elsie," and the postmortem observations of typical argyrosis, since reported. Vogt's analogy between this finding of silver and the possible finding of copper as something quite natural is fallacious. Copper is a normal constituent of the organism and is found in almost all foods, while silver is never found except when it has been taken as a medicine.

LOCALIZATION OPHTHALMOSCOPY. DR. PAUL, Lueneburg.

A localizer has been devised by which retinal meridians can be planned, plotted and marked out in their prolongation on the sclera and cornea. A ring, marked in degrees, on a holder has a second, moveable ring at its back, which can be set by a screw. The horizontal meridian of the front ring is marked by a "spider" wire stretched across it. In the diameter of the posterior ring an extremely thin marking plate is fastened, so that the narrow edge of the plate faces the forward ring. By rotation of the latter, the edge and, with it, the indicator plate can be set at any degree. At its back the plate is cut out so that it adapts itself exactly to the form of the globe and lids. The posterior edge can thus be brought into close apposition with the cornea and the limbus with every position. In use, the back ring is rotated until the edge of the indicator plate is set in the desired meridian, which has been previously determined by localization ophthalmoscopy (Paul, Heidelberg: Transactions of the German Ophthalmological Society, 1932). The instrument is now held in front of the cocainized eye, which looks straight forward, so that the middle of the ring, i.e., the intersection of the spider line and the front edge of the indicator plate, comes to lie directly in front of the middle of the cornea, and the fine wire crosses the globe in the horizontal meridian. The posteriorly protruding points of the indicator plate touch the limbus at the point where the looked for meridian crosses it and can be marked with a sharp colored pencil using the edge of the limbus indicator plate as a ruler, or more definitely and permanently by a touch with the cautery point, afterward. Close apposition of the indicator plate and accurate marking of the required axis are obtained, particularly if the lids are kept wide open with a lid speculum. The plate can be freed by two small screws and removed for sterilization. Spare plates in any desired form can be improvised by trimming old safety razor blades with scissors after the blades have been heated over a flame to a dull red heat and thus softened without completely losing their elasticity.

RETINAL DETACHMENT AND FLUID EXCHANGE IN THE EYE. DR. E. LOBECK, Jena.

Detachment was brought about at will either with or without a retinal tear, in the course of experiments with puncture suction and evacuation of the vitreous. If the negative pressure of suction was kept up while the very coarse cannula was withdrawn, a tear resulted, but not otherwise. From 0.3 to 0.95 cc. of vitreous was drawn off at the rate of 0.1 cc. every ten to fifteen seconds. In thirty rabbits' eyes twenty-two detachments were induced with a tear; eight detachments without a tear. Studies of the fluid exchange made use of a very fine needle, with which, under ophthalmoscopic control, a minute drop of isotonic colloidal sepia was injected into the vitreous and its diffusion studied with the slit-lamp for several hours. The eyes were enucleated from two hours to ten days after the injections of india ink and examined histologically. In every case the ophthalmoscope showed a definite migration of the particles of ink toward the retinal tear, and histologic study showed that the sepia pigment had gone through the tear and via the choroidal vessels to regions far behind the retina. In healed retinal

tears (in a histologic specimen) a sepia track toward the scar was seen, especially toward the choroidal vessels, at the points where the margin of the tear had become agglutinated to the choroid. The retroretinal space contained no sepia. These observations justify the conclusion that in artificial detachment with tear a significant change takes place in the exchange of intra-ocular fluid. The exposed choroid, no longer covered by the retina, presents as a new drainage area for the intra-ocular fluids, materially diminishing the flow to the anterior chamber. After closure of the tear, normal hydrostatic conditions are again established. Until then, and often after that, tonometry shows that intra-ocular tension remains persistently low and the loss of volume of the globe, due to the drawing off of vitreous, is made good very slowly if at all. The exposed vessels (veins and capillaries) have a suction action, as indicated by the migration of particles of sepia through the open tear, and the capillary pressure in the choroidal vessels must be less than 30 mm. of mercury.

DETACHMENT AND SEQUELAE OF OCULAR INJURIES. DR. GONIN, Lausanne, Switzerland.

Nonperforating injuries rarely cause detachment in a normal eye. In predisposed eyes (with a high degree of myopia, etc.) even insignificant contusions or concussions are certified as causes of detachment, purely on the basis of the nature of the trauma and the time coincidence. A flap-shaped tear (*Lappenriss*) points to a previously existing adhesion between the vitreous and the retinal surface. This enables one to differentiate between cases due to a single, determining fact and those in which the trauma was the immediate cause and previously existing disease of the eye a predisposing factor.

PRESENT STATUS OF THE UNDERMINING METHOD IN DETACHMENT. DR. LINDNER, Vienna, Austria.

This method was first devised by Dr. Lindner for a retinal hole at the posterior pole and was used successfully in two cases. He now uses it for the ordinary detachment. From Jan. 1 to the middle of March, 1932, he operated on fourteen patients, on ten of them for the first time. Of the others, one had been operated on by cautery perforation (Gonin) four times. This case and one of the ten in which no previous operation was performed are excluded as not suitable for evaluation of Dr. Lindner's procedure, as the latter found that the detached retina was held fast by connective tissue strands and gave no prospect of recovery. Of the three patients operated on previously (in the fall of 1931) by trephining and multiple (chemical?) cauterization (*Abriegelung*) without complete success, two were cured who would scarcely have been healed by any other method. The third patient is not completely cured, as shadows of vessels (*Gefaess-Schatten*) are visible. Complete reattachment occurred in four of the nine patients while they were wearing stenopeic spectacles. All the patients were cured but one, who showed shadows of vessels two and a half months after operation. In five cases, two of which went on to cure, there was no flattening of the detached area. This new method is much less severe than multiple trephining with chemical cauterization in rows, and there is less danger of intra-ocular clouding by exudation or hemorrhage. In addition, with more

closely spaced trephine openings this procedure is more easily performed, and the time of operation is materially shortened. In comparison with the method of binding down the retina (*Abriegelung*) with single points of cauterization, the undermining method has the disadvantage that the blocked off (*abgeriegelte*) retina is also cut off functionally, which is not always the case with the former method. Dr. Lindner showed pictures demonstrating the evidence of vitreous traction in detachment, and he considered the question of when to operate.

REPORT ON THE DETACHMENT OPERATION WITH POTASSIUM HYDROXIDE. DR. GUIST, Vienna, Austria.

One or more tears were found in an overwhelming majority of the cases of detachment seen since 1928. There were cases showing a primary tear; in others he observed, clinically and histologically, flat detachment without a tear, and an extensive detachment did not occur until the retina—which is usually cystic and degenerated in this area—and the vitreous membrane ruptured. The mechanics of tear formation are variable. Large flap-shaped tears (*Lappenrisse*) are made possible by the factor of retinal elasticity, as a result either of thinning of the sclera in the area or of traction from within. Small, multiple holes on the other hand, like most tears in the macular region, develop on a basis of cystic degeneration of the retina. If the hyaloid membrane is still present in the area of the retina (vitreous detachment), the former must rupture. If it remains intact, there are retinal tears but no detachment. A retinal detachment can flatten out and reattach only when the structure and membrane of the vitreous are so delicate as to offer no resistance or the vitreous membrane is separated from the retina. In any other case, particularly if the vitreous structure is tough, an irregular (*buckelig*) detached retina will not flatten out when the eye is at rest. If the vitreous cavity communicates with the subretinal space by a tear, there will be equal pressure on both sides, and if the tear is closed and subretinal fluid is drained off, the pressure in the vitreous will now bring the retina back into its former position. By the large number of operations performed according to Guist's method, it has been shown that it is essential for the prevention of relapses to bar off from the rest of the retina not only the margins of the tear but the entire retinal region where tears generally occur (a zone from 8 to 17 mm. behind the limbus), so that the retina beyond the block (peripheral), if it should remain detached or detach again, is unable to communicate in any way with the subretinal space behind the bar (*Riegel*). In view of this fact, accurate localization has come to be considered superfluous. For the cure and prevention of relapses one must have a sufficiently large number of trephine openings and cauterization points of the choroid (lamina vitrea) to bring about a continuous and dense adhesion between retina-choroid and sclera. It is only in case of discontinuity (*Unterbrechung*) of the lamina vitrea that sufficient connective tissue is able to make its way into subretinal space and retina. All methods which do not meet this prerequisite must, from this consideration, be followed frequently by relapses. A choroiditic focus with an intact lamina vitrea causes atrophy of the first neuron of the retina; this space fills with fluid, and it is just in this region that the retina can tear loose. Complications met with in the author's procedure, such as hemorrhage, acute iritis, a deep

anterior chamber with or without a rise of tension, and necrosis of the sclera, can be prevented by appropriate countermeasures. Of course, even with this method an occasional eye will have to be enucleated. Dr. Guist now performs an initial operation in not more than thirty minutes. Of one hundred and nine in which operation was performed between October, 1930, and December, 1931, 77 per cent of the uncomplicated cases and 18 per cent of the complicated cases (hemorrhage, retinitis proliferans and iridocyclitis) cleared up. Cure was obtained in 57 per cent of the cases in which ignipuncture was performed three or four months before, in 11 per cent of those in which it was performed eight or more months before, and in 38 per cent of thirteen aphakial cases; the average for all the patients operated on was 56 per cent cured, most of them having complete fields and twenty-seven being able to read small print (Jaeger test type no. 1).

Operative Treatment of Detachment. Dr. Clausen, Halle.

Rapid and complete closure of the tear is the first thing to strive for, and this implies, as the first requisite, accurate localization. Gonin's measurement by gaging papillary diameters is not sufficiently accurate. Dr. Clausen prefers his modification of a procedure originally suggested by Graefe-Hirschberg for locating a foreign body or parasite. The eye is brought into the center of curvature of an ordinary perimeter; while it fixes the zero point, the tear is searched for with the ophthalmoscope. When it appears in the previously dilated pupil, the perimeter arm is rotated into the meridian of the ophthalmoscopic light beam, and the degree is read off. From this one can reckon the distance of the tear, from either the posterior pole or the limbus. This can be checked up by other observers, and, conversely, by ophthalmoscopy along the zero axis while the patient's eye follows a light source moving along the perimeter arm until the tear appears in the pupil. The perimeter arm values are reduced to globe values by means of the tables of Donders and Alfred Graefe (for the hand perimeter) respectively. To measure off on the globe the arc which has been calculated from its previously obtained sine, a guiding thread is used, which is carried through the limbus in the localized meridian and fixed by means of a knot in the limbus near the tear. This is again checked up on the operating table by ophthalmoscopic examination, to see whether the meridian marked by the guide thread runs directly through the middle of the tear. The success of ignipuncture depends much more on accurate meridian localization than on a possible small error in estimating the length of the arc, as the ignipuncture usually has an average diameter of from 3 to 4 mm. This method of localization proved so accurate that the first ignipuncture missed the tear in only one patient out of fifty. Of sixty-two patients, the first forty-eight were operated on with the Paquelin (Gonin) procedure and the other fourteen with a high frequency current, i. e., with the diathermy apparatus, by means of electrocoagulation, which allows one to operate more surely and quietly and also to modify the dosage at will by a wide choice of the size and form of the electrodes and a change in the intensity of the current. Of twenty-three cases, 37 per cent showed cure, effected in six of fourteen by coagulation. The oldest case of complete cure goes back two years and eight months. Vision improved, in some cases markedly, with a decided increase in the fields in 24 per cent.

Failure occurred in twenty-four cases (39 per cent); six were cases of relapse, and three of profuse hemorrhage into the vitreous for fourteen days after operation. Myopia of from 3 to 25 diopters was noted in 63 per cent. A tear was not found in eleven cases (18 per cent). In five cases it was found only after several days of rest in bed with an occlusive pressure bandage. In one case the tear was found only after a preliminary puncture. Most of the patients were between 40 and 60 years of age. In one case of limited detachment of sixteen years' standing, electrocoagulation brought about complete reattachment, In six cases of tuberculous periphlebitis of the retina Dr. Clausen did not proceed to operate until definite tears appeared and the detachment had assumed threatening proportions. In eleven cases, on account of progressive loss of sight, cauterization was carried out over the deepest point of detachment, in spite of inability to find any tear. In two of these cases there was complete reattachment; in two, slight improvement.

(To be continued)

FRENCH OPHTHALMOLOGICAL SOCIETY

Forty-Fifth Meeting and Celebration of Fiftieth Anniversary, Paris, July 18-21, 1932

Abridged Translation by Dr. Percy Fridenberg, New York

Some French Masters of Other Times. Dr. A. Terson, Paris.

For this jubilee, Terson presents some historical data of the forerunners and contemporaries of Jacques Daviel, who revolutionized ophthalmic surgery, with little known portraits of Mery, La Faye and Tenon. Mery was the first to see the retinal vessels in a living animal, considered the ciliary processes to be the source of the aqueous humor, had Saint-Yves and J. L. Petit perform the first extraction of a dislocated lens, and predicted the operation of Daviel for which La Faye preferred the bistoury to the lance-knife and scissors. The latter's lid forceps resembles that of Desmarres. Tenon discovered the oculo-orbital aponeurosis, improved the extraction operation, and reported many observations of congenital cataracts and of curious operations, among others that of the brother of Turgot. These three masters, anatomists, surgeons and ophthalmologists, will always be looked on as models of originality in science, of heart and of goodness.

Ideovisual Synthesis in the Education of Deaf-Mutes. Dr. de Mets, Antwerp, Belgium.

The new Belgian method of demutisation in use at Brussels and Antwerp is reported. This consists essentially in the simultaneous teaching of reading and writing, in lip reading—not of letters but of words, greatly aided by the pictures of objects. Speech thus is born spontaneously and is corrected by exercises in front of the mirror, and by the sense of touch. The visual and chromatic senses play an

essential part in this education, which excludes all mimicry. It has given marvelous results throughout Belgium (1,500 cases), and its use is spreading in other countries, especially France.

THEORY OF CORRECTING LENSES GIVING PUNCTAL IMAGES. DR. MARCEL DUFOUR, Nancy.

Dr. Dufour points out a theory of these glasses which does not require complicated algebraic calculations and is consequently, more accessible to those not versed in mathematics.

IS THERE A MYOPIC "DISEASE"? DR. LEMOINE and DR. VALOIS, Nevers.

The authors discuss the etiology and treatment of a special form of chronic diffuse or, better, "ectatic" sclerochoroiditis which appears to have a causal relation to some grave, progressive forms of myopia. The malady is most often due to tuberculosis, hereditary syphilis and infectious foci near by, in that order, and occasionally to endocrine disturbances.

OPERATION OF CHOICE IN TRACHOMA-ENTROPION OF THE UPPER LID. DR. JUNES, Sfax, Tunis.

Tarsotomy, in the traditional mode, i. e., high up and, above all, with vertical sutures, causing so many different kinds of trouble, threatens to bring discredit on the procedure so highly praised by Panas and his school. A low tarsotomy is, on the contrary, a *sine qua non* for success in dealing with a trachomatous tarsus. The operation *par excellence* will also do away with vertical sutures, substituting tarsociliary sutures of a U form, arranged horizontally.

VITAL STAINING AND BIOMICROSCOPY OF THE CONJUNCTIVA. DR. CUENOD and DR. NATAF, TUNIS.

Previous studies and observations are confirmed. The coloration is superficial and involves only the first few layers of epithelium. The epithelial cells which take up the stain, intra vitam, are in all probability reaching the final stage of viability or the evolution cycle. This staining method may be of practical use in the differential diagnosis between lymphatic or lymphoid elements and other histologic units.

LATE VEGETATIONS WITH SYMBLEPHARON IN VERNAL CATARRH. DR. PASCHEFF, Sofia, Bulgaria.

The author considers this disease, which is a monopoly of infancy and adolescence, as a fibro-adenopapillary hyperplasia of the conjunctiva. In the case reported, the patient lost sight rapidly at the age of 54. Large vegetations formed at the limbus in both eyes. Histologic examination of these growths showed papillary vegetations, very rich in blood vessels and much infiltrated by plasma cells. The superficial thickening of the cornea showed adenoid tissue with fine proliferating vessels, densely infiltrated by plasma cells—which is not usual. Bowman's membrane was detached and torn. There was marked sym-

blepharon, particularly of the lower culdesac, typical of true trachoma. General examination showed adhesive pleurisy, a positive Mantoux reaction, general eosinophilia (12 per cent) and tracheobronchial adenopathy. Spring catarrh is very common in Bulgaria, generally between the ages of 5 and 20, and about six times more frequent in males than in females. The author's case is unique in presenting a combination of the lymphadenoid hyperplasia of true trachoma, which first involves the cornea and later the conjunctiva of the limbus, with the fibroadenoid hyperplasia of spring catarrh which progresses in an opposite direction. Etiologically, the case shows the intimate relation with lymphatism, adenopathies, lymphocytosis, eosinophilia and even tuberculosis.

MELANOTIC SARCOMA STARTING FROM PTERYGIUM. DR. MARIN AMAT, Madrid, Spain.

A patient, aged 43, had a small membranous pterygium in both eyes. Three years before, a small black spot appeared in the pterygium of the right eye, spread, little by little, and, for about a year, had been increasing in height. It now resembled a large black wart, protruding between the lids and preventing complete closure. Treatment consisted of four applications of 39.5 mg. of radio-element, 108 hours each, for a total of 636.96 mg. of radio-element. The result was radical cure of the neoplasm which histopathologic examination showed to be a melanosarcoma, with preservation of the pterygium, which, like the globe, was not involved in any way.

SENSIBILITY OF THE CORNEA. DR. MARX, Rotterdam, Holland.

The knowledge of the sensibility of the skin in general and of that of the cornea in particular is rather limited. Hence the clinical and experimental data as to the sensibility of the cornea are indefinite and may easily be interpreted incorrectly and lead to false conclusions. The author presents a set of hairs, graduated to produce definitely varied degrees of pressure and giving a regular exponential curve, to determine this sense of the cornea. Tests in cases of simple glaucoma, interstitial keratitis, iridocyclitis, corneal opacities and herpes show diminished sensibility, which, incidentally, cannot be determined accurately by the use of a single hair. The series must be used and the curve plotted.

VARIOUS FORMS OF CORNEAL HERPES. DR. FAGE, Amiens.

The investigations of Levaditi, Harvier, Nicolau and others have shown the specific, infectious nature of herpes, which must be considered as an inflammatory process of nerve filaments due to a filtrable virus. Certain keratitides which were formerly given special names according to the topography of the lesion, and the real etiology of which was unknown—so that they were looked on as special individual morbid types—must be brought into relation with herpes. Hansen Grut's ramifying keratitis, Emmerts' keratitis dendritica, disciform keratitis, ulcerous keratitis with dotted (étoilé) furrows of Gillet de Grandmont and keratitis punctata superficialis of Fuchs must all be

considered as unrecognized forms of corneal herpes. Most of them can be inoculated into the cornea of rabbits and produce the characteristic clinical and histologic features of herpes, as shown by Gruter, Bencini and others in keratitis dendritica and disciformis, while Nordman and Duhamel saw the last-named form develop from a classic herpetic keratitis.

THREE CASES OF KERATITIS PUNCTATA SUPERFICIALIS: ETIOLOGY, TREATMENT. DR. FRADKINE, Autun.

This subepithelial corneal disease is to be regarded as an ocular localization of a constitutional infection, generally grip, which was the etiologic factor in all three of his cases. Local treatment was quite ineffectual, but a complete and rapid cure was obtained by anti-infectious therapeutics, viz., the use of methenamine iodide and sodium salicylate. In all three cases, only one eye was affected, probably owing to the prompt institution of active treatment.

TRAUMATIC KERATITIS AND TRANSITORY HYPOPYON. DR. PROUST, Tours.

The author reports twelve cases (caused by chips of stone, twigs and foreign bodies extracted late) accompanied by rapidly developing transitory hypopyon, with slight corneal trauma, no evident disease of the lacrimal passages and only rarely a positive bacteriologic finding. The author considers various factors in the possible pathology and etiology of these forms, which show no initial infectious focus of any importance. The field (*terrain*) plays a part, as do the direct and irritating action of the wounding agent and contact with sources of secondary infection. Interesting details of corneal biomicroscopy are given. A moderate and vigilant course of treatment generally suffices to cut short this disease. It is necessary to distinguish between these cases of attenuated virulence, which show a natural tendency toward spontaneous recovery, and the frankly purulent deposits loaded with pneumococci to which it is essential to apply the red hot iron without delay if one does not wish to have a serious outcome.

FREE CYST OF THE ANTERIOR CHAMBER. DR. HAMBRESIN, Brussels, Belgium.

The author reports the case of a highly myopic woman, aged 58. Fukala's operation had been done thirty-eight years previously and was followed, ten years later, by detachment with complete loss of vision. In the anterior chamber a brownish cyst, entirely unattached, was seen, which looked exactly like a shot pellet and literally rolled about in the filtration angle. The slit-lamp showed granules of pigment on the wall of this cyst, which was very thin, slightly transparent, and contained no vessels. As to pathogenesis, the author thinks that this cystic formation had its origin in the pigment epithelium of the posterior surface of the iris, with consecutive rupture of its attachment. There may have been a separation of the two pigment layers or simply proliferation of the epithelium, unless, possibly, the lesion was a cyst of the pupillary margin which had become detached.

MULTIPLE PUPILLARY CYSTS, HEREDITARY AND FAMILIAL: THEIR EMBRYOLOGIC SIGNIFICANCE. DR. VILLARD and DR. DEJEAN Montpellier.

Since infancy, a woman, aged 29, had had a number of dark brown cysts at the margin of each iris which masked almost the entire pupil. Her mother and one brother presented the same malformation. The cysts had the form of a small teat with a pedicle, like the swollen bellies of the ticks which infest dogs. Between these quivering masses, vision (5/10) was possible. The slit lamp showed the cysts to be composed of a transparent medium in a very fine brown envelope with a cracked surface. The pedicles were attached to the posterior epithelium, i. e., the pars retinalis of the iris. The cysts were inclusions of fluid between two layers of pigmented epithelium. Ontogenetically, this congenital malformation was a persistence of the retinal ventricle at the anterior extremity of the optic "cupola" and amounted to a prolongation of the cerebral ventricles into the eye.

UNILATERAL DIPLOCORIA WITH INCREASED INTRA-OCULAR TENSION. DR. HAMBRESIN and DR. COPPEZ, Brussels, Belgium.

A woman, aged 52, with antecedent bacillary infections and a positive Bordet-Wassermann reaction, showed an absence of two fifths of the surface of the left iris, giving the impression of an unusually broad peripheral iridectomy. This developed, without the slightest pain or sign of inflammatory reaction, when the patient was 20 years of age. Twenty-nine years later, vision began to fail from a glaucoma, which may well be considered secondary. The pathogenesis of this essential atrophy of the iris is still hypothetic. Destruction invariably involves all the layers of the iris. As to the course, the pupil seems first to become irregular and decentered. The stretched portion of the iris becomes progressively atrophic, and glaucoma develops only after there has been notable destruction of iris tissue. Therapeutically, one seems helpless. Sclerectomy might do away with the positive tension, but would not stop the advance of atrophy.

OBSERVATION OF SYMPATHETIC OPHTHALMIA. DR. ROCHE, Marseille.

Three cases were studied carefully, and another was noted incompletely during the World War. The first, caused by a small stump which had continued to be painful, came on ten years after the original injury. Three patients, in whom the exciting eye was enucleated, recovered. This operation could not be carried out in the fourth case, in which almost complete blindness developed. Strikingly, it was the exciting eye which had retained some vision. In this last case, active treatment was carried on for several months.

SOFT GLOBE; PUPILLARY SECLUSION; RECOVERY OF NORMAL TONUS AFTER IRIDECTOMY. DR. SEDAN, Marseille.

Following a penetrating wound with traumatic cataract, iritis, iridocyclitis and seclusio pupillae, dating from 1924, and an attack of glaucoma in 1925, iridectomy was performed in 1927, unsuccessfully, as the

coloboma closed up; it was repeated with capsulotomy in 1929. The anterior chamber disappeared, and the globe became quite soft (tension 10 mm. of mercury) but with good projection of light and preservation of iris in the lower portion. There was marked arterial hypotension. After using an ephedrine type of preparation, the author did a third iridectomy (downward). The gap remained open, and tension rose to 25 mm., with a deep anterior chamber. This lasted for a year and a half. The operative gap in the iris, which allowed the aqueous to fill up the anterior chamber, causing a crowding of the vitreous with a rise in its tension as well as reflex excitation of the organ (*glande*) secreting the aqueous fluid, and the reestablishment of choroidal circulation were the factors raising the tonus to normal. This rapid recovery of tension is the more surprising as the eye had been opened three times before that and there was great risk of causing phthisis bulbi by a fourth operation. The call for an "open door" in the anterior chamber for the aqueous humor balanced this risk. Probably the choice of a section of normal iris for the iridectomy had much to do with the favorable result, as opposed to the previous failures.

The formal, nonscientific session (*Séance Solennelle*) was held at the Faculté de Médecine, and was followed by a reception at the Hôtel de Ville. The papers presented at the next scientific session are as follows:

First Report: The Vitreous: Its Development, Structure and Physiochemical Properties. Dr. Redslob, Strasbourg.

Formation of the Vitreous Body from the Basal Membranes: Its Lamellar Structure. Dr. Dejean, Montpellier.

The vitreous, an anatomic, histologic and embryologic enigma, starts —according to the author's research dating back to 1922—from a proliferation of the limiting membranes. Stains which have an elective affinity for collagen show the presence of these membranes at the border of the primary and secondary optic vesicles, as the "sole inhabitants" of the future vitreous cavity. In young embryos of mammals, carefully sectioned in series, one sees the limiting membrane adjacent to the retina broaden, form numerous reduplications and fill the vitreous space with the product of its successive cleavages. This basal membrane is the true "matrix" of the vitreous, and at any point (isthmus) where the hyalogenetic fecundity is not developed, it remains in the state of a membrana limitans, with all the stages of transition toward a vitreous. In accordance with its origin from the proliferation of a hyaline lamina, the vitreous in the adult continues to be an intercalation of hyaline layers. This is demonstrated by histologic study, experimental gross pathology and biomicroscopy, if we bear in mind that these transparent lamellae are invisible except when seen in profile, as in the case of sheets of glass. The fibers and fibrils seen under the microscope are in truth the cross-sections of these layers.

Origin, Histology and Physicochemical Properties of the Vitreous. Dr. Mawas, Paris.

SECOND REPORT: BIOMICROSCOPY OF THE VITREOUS. DR. KOBY, Basel, SWITZERLAND.

After the executive session, there were operative sessions at the hospitals of Professors Terrien, Poulard, Cantonnet and Chevallereau, a river trip to Sèvres and its potteries, and a formal dinner at Saint-Cloud.

FROM EXTRACAPSULAR TO INTRACAPSULAR EXTRACTION. DR. VAN LINT, Brussels, Belgium.

During the last thirty years the author has progressed through various procedures: simple extraction, sliding conjunctival flap, palpebral akinesia, Barraquer's intracapsular extraction, extracapsular extraction with a keratome incision and intracapsular extraction with a (lateral) keratome incision. He sums up the progress realized as follows: infrequent loss of vitreous, infections almost unknown, secondary cataract done away with and the operations on immature cataracts made feasible.

ACCIDENTS AND COMPLICATIONS IN TOTAL EXTRACTION OF CATARACT. DR. BARRAQUER, Barcelona, Spain.

Unpleasant or dangerous sequelae are almost always avoidable and due to defective technic. The correctly performed complete operation is free from postoperative complications. The author discusses the various causes of accidents, the means of avoiding them and the important factor of the general condition of the patient. This was followed by a micro-cineprojection of the mechanism of zonular rupture in phacoeresis and in intracapsular extraction with forceps.

DISCUSSION

DR. KALT, Paris: Dr. Kalt noted the general enthusiasm for extraction in the capsule or with capsulectomy. This procedure conceived long since (by de Wecker and others) did not become really practical until a forceps was devised by Kalt which bears his name and which was constructed on the principle of grasping the capsule without tearing it with teeth. This instrument was presented to the Ophthalmological Society of Paris in 1909, after several years of testing, and its advantages were recalled at the French congress in May, 1910. At that time, Kalt said: "Combined with the suture, one obtains magnificent results," but his initiative brought him only ironical smiles. "What complications for a simple operation!" it was said. Still Kalt persisted. Hundreds of surgeons have seen him operate at the Quinze-Vingts, especially since the War, and the "Kalt forceps" has gone all the way round the world. In spite of all this the operation had to come back to France from abroad, under another name of course, before some remembered having seen it performed on a large scale in Paris, at the Quinze-Vingts, almost twenty-five years before.

HISTOLOGY OF FRESH DETACHMENT OF THE RETINA. DR. SOURDILLE, Nantes.

Two cases with quite opposite characteristics seem to show, above all, that in detachment the retina is the diseased structure. This may sound

rather commonplace, but one seeks in vain for a statement to the same effect in the works which treat of this subject. The lesions of the choroid and vitreous are always stressed. The author insists that the former are merely predisposing (*préparatoires*), the latter secondary and accessory. The pathologic changes in the retina may be limited to a very small area (case 1), or diffuse and widespread (case 2). It is quite probable that the extent and gravity of these retinal lesions play a part of basic importance in the development of detachment and that they determine the prognosis. They explain why one detachment can be cured "off-hand" by a single cauterization applied exactly at the diseased spot, in a case with a limited retinal lesion, while in another, treatment by repeated multiple cautery punctures is the only one giving any prospect of success, on account of widespread retinal lesions. As to tears, examination of these sections makes it difficult to explain them by the mechanism of traction from the vitreous.

RETINAL TEARS WITHOUT APPRECIABLE DETACHMENT. DR. JEANDELIZE and DR. BAUDOT, Nancy.

In the course of examinations of the fundus oculi, especially in cases of slight ametropia, the authors have noted the appearance of retinal tears and disinsertion without noteworthy, or in fact, any, detachment. The solutions of continuity were all noted in quite young subjects with normal vision and no other pathologic signs. No subsequent detachment was noted in from one to one and a half years. These observations by no means invalidate the important part played by the tear, which most often follows a phase of exudation or transudation from the choroid and which accordingly must be considered as a secondary, although a very early, complication. To explain the absence of detachment in spite of tears, the authors have recourse to what they call barrages or barriers to detachment. Such a barrier may be presented by a line of chorioretinitis of which they show a curious example, or simply by a more solid anchorage than usual of the rods and cones in the pigment epithelium, and a tear may develop without leading to operation.

EXPERIMENTAL RETINAL DETACHMENT. DR. WEVE, Utrecht, Holland.

The author discusses treatment by diathermy, shows plates with a brief description of his methods of localization and gives the indications for: (1) nonperforating coagulation of the sclera with a probe-pointed electrode, (2) perforation with a needle electrode and (3) a combination of the two foregoing procedures. This method allows one to control the operation by ophthalmoscopy and to check up on or correct localization by an exact anatomic landmark. It is simple and not dangerous, allows one to solder the most extensive tears and especially disinsertions in the region of the ora serrata, and loss of vitreous is minimal.

NEWER POINTS OF TREATMENT OF DETACHMENT. DR. RUBBRECHT, Bruges, Belgium.

The author presents an experimental study of the effects of thermopuncture, with precise data as to the advantages and disadvantages of heat as an agent in the production of adhesions between the retina and choroid. The main gain is the immediate fixation of the retina to the

underlying tissue with every prospect of rapid agglutination. The drawbacks are the limited effect and the impossibility of dosage. Complications to be apprehended are necrosis of the retina and hemorrhages. The latter predispose to connective tissue proliferation, which may go far into the vitreous and cause new detachments. These disadvantages have led to a search for other cauterizing agents. Rubbrecht has tried abrine, a vegetable toxin which acts like an antigen and thus is analogous to bacterial toxins. Jequiritol (Merck) in four degrees of concentration allows the intensity of the irritation to be regulated. This substance produces in rabbits foci of chorioretinitis, resulting in broad adhesions between the two membranes. The first clinical tests were favorable. Of four reattachments obtained, the first has persisted for one and a half years.

TREATMENT OF DETACHMENT BY PERFORATING DIATHERMOCOAGULATION. DR. GENET, Lyon.

The object of this method is to cause an irritation of the wall of the detachment pocket by generating a spark of diathermocoagulation within the pocket. It was expected that the fluid of the detachment would aid in transmitting the irradiation and in spreading it more uniformly throughout the enveloping tissues, and thus create changes in these membranes which would make them tend to agglutinate after withdrawal of the subretinal fluid accumulation. An indifferent electrode in the form of a large metal plate is brought directly in contact with the skin of the patient and, preferably, directly underneath the site of disease. The active electrode is a needle which is insulated to within 2 mm. of its point, and it penetrates at the region of detachment. The current is passed for two seconds. This method has been used only since October, 1931, so that it is too early to give any statement as to final results. The immediate results were very satisfactory. The procedure seems less destructive than thermopuncture or galvanopuncture, and can be repeated without bringing about degenerative changes in the tissues.

DOSAGE OF TRANSSCLERAL DIATHERMOCOAGULATION WITH THE PYROMETRIC ELECTRODE. DR. COPPEZ, Brussels, Belgium.

A combination of the active diathermy electrode with a thermoelectric couple allows one to measure the temperature of the tissues at the site and at the moment of formation of the eschar. With this instrument the author has studied, in rabbits' eyes, the quality of the eschar produced at different temperatures by transscleral coagulation of the chorioretinal plane according to the method of Sven Larsson.

COATS-VON HIPPEL'S DISEASE. DR. POYALES, Madrid, Spain.

Angiomatosis of the retina added to an exudative retinitis, with vascular degeneration as a final phase, indicates that these two diseases may form one. The author reports a case in which atheromatous degeneration in bleb (*boule*) form is clearly seen, recalling the ophthalmoscopic picture of von Hippel's disease. This special form is entirely distinct from those forms of Coats' disease in which there is a thickening and dilatation of newly formed vessels with aneurysms in their course.

SIGNIFICANCE OF DIASTOLIC OBLITERATION OF THE RETINAL ARTERY. DR. FRITZ, Mons.

Following the studies of Vaquez and his school, some authors question whether this phenomenon is not an index of the mean pressure rather than of resistance of the vessel wall. This assumption is disproved by the fact that in certain cases the obliteration or collapse supervenes at different degrees of compression in different branches of the artery, whereas mean pressure should be identical at corresponding and adjacent points of the vascular tree. Furthermore, an experiment in which tubes of unequal degrees of elasticity (*souplesse*) are introduced into an artificial circulation and subjected to compression shows definitely (1) that the softest section of the tube collapses under weaker compression than the more rigid section, and (2) that the degree of compression necessary to produce this collapse is in neither case that of the mean pressure. Diastolic obliteration in relation to the appearance of the first pulsations is accordingly an index of the resistance of the vessel wall and does not depend on mean pressure.

OCULAR SYMPTOMS IN HEREDOFAMILIAL CRANIOFACIAL DYSOSTOSIS. DR. BADOT, Jumet.

The constant ocular manifestations observed in these cases are: (1) bilateral exophthalmos, varying in different cases; (2) divergent strabismus, intermittent or continuous, and (3) "optic neuritis," which may go on to papillary atrophy, in which, in well specified cases, decompressive trephining may give results. Aside from these, there are accessory symptoms: myopia, hypermetropia and disturbance of color sense. Slightly marked forms should be watched for and differentiated from the osseous malformations of adenoidism. This is important diagnostically and therapeutically.

Operative sessions were held at the hospitals by Professors Monbrun (surgical and ophthalmological diathermy), Magitot, Kalt, Baillart (demonstration of retinal vascular pressure), Vincent (neurosurgery), Dupuys-Dutemps (dacryocystomy), Merigot de Treigny (dacryocystotomy; resection of the bony plate) and Worms (decompressive trepanation of the optic canal; diathermy of the lacrimal passages; tonsilloretinal reflex).

CASE OF BUPHTHALMOS WITH PSEUDOGLIOMA OF THE RETINA. DR. PESME, Bordeaux.

The left eye of a child aged 4 years was enucleated for glaucoma, with marked pain and reaction. Histologic examination showed, in addition to the congenital malformation (absence of the filtration angle) which had brought on the glaucoma, a total detachment of the retina with a hemorrhagic subretinal exudate. The retina itself was markedly affected, showing hemorrhagic and inflammatory lesions which had resulted in the formation of cicatricial tissue, with marked retinal gliosis in places. This type of hemorrhagic retinitis, with massive secondary exudation, in the newly born has been observed previously by the author and others, and deserves concerted study to determine its place in the rather indefinite group of pseudogliomas.

CONGENITAL HYDROPHTHALMOS: HISTOLOGIC CHANGES. DR. KALT, Paris.

A child aged 6 months, affected with moderate hydrophthalmos, was operated on, two days previously, for marked hypertension. In addition to the usual lesions—thickening of the inner wall of Schlemm's canal, owing to a developmental defect or obstruction—Kalt found in the trunk of the optic nerve, 3 mm. from the globe, an old focus of obliterating endophlebitis of the central vein, with endarteritis in the vicinity, dense gliosis of the parenchyma and marked sclerosis of the connective tissue trabeculae. The intra-ocular vessels were normal. This was a case of a perivascular infectious focus dating from intra-uterine life and acting in the same way as a phlebitis of the central vein in an adult, to cause glaucoma in a fetal eye.

MEAN TENSION OF THE CENTRAL RETINAL ARTERY. DR. BAILLART, Paris.

This pressure, easily determined by means of tonoscopy, is 45 mm. of mercury for the normal mean humeral pressure of 80. It is indicated by the most marked pulsation. At that moment the artery collapses completely in diastole. The author studies the relations between mean pressure and the resistance of the vessel wall.

NEW CLINICAL SIGN IN DIAGNOSIS AND PROGNOSIS OF RETROBULBAR NEURITIS. DR. WEEKERS, Liège.

A positive scotoma is not met with in retrobulbar neuritis, but in certain cases and under special conditions it is possible to elicit a positive scotoma of a form which has not yet been described because it has to be provoked and is transitory and fleeting. The great variety in the clinical course and severity of retrobulbar neuritis reflects the diversity of etiology and pathogenesis. The new symptom described corresponds to a definite lesion involving the histologic substratum on which depends the adaptation of central vision to varying intensities of illumination. Neuritides with a positive finding gave a favorable local and general prognosis. This sign enables one to identify a special type among the retrobulbar neuritides of indeterminate origin and cause.

OPTIC ATROPHY CONSEQUENT ON TREATMENT WITH STOVARSOL FOR DEMENTIA PARALYTICA. DR. LACROIX, Rouen.

The chemical cited, an injectable derivate of stovarsol (pentavalent arsenic) has greatly improved the prognosis of a disease which is incurable, and fatal if left to itself. Its efficacy is at least equal to that of malarial therapy; it results in no fatal accidents, and the technic of injection is much more simple. Keeping within the dose prescribed by Sézary and Barbé (injections triweekly of 1 Gm. each for seven weeks, i.e., 21 Gm.), one can avoid the ocular complications which are always to be feared with series of pentavalent arsenicals. Nevertheless, Lacroix reports two cases of optic atrophy and blindness coming on in the course of such treatment with the doses prescribed, in subjects whose vision, although it could not be measured exactly, was "practically good" until then. These obscure cases show the necessity for careful examination

of the visual paths before and during treatment with stovarsol, especially in the initial stages of dementia paralytica, which seem to be most affected by it.

UNCOMMON DISEASES OF THE OPTIC NERVE OF ORBITAL, NASAL AND TOXIC ORIGIN. DR. PASCHEFF, Sofia, Bulgaria.

1. Choked disk resulted from compression of the retinal vessels immediately behind the globe by an echinococcus cyst of the orbit. After this was extirpated, vision and fields were rapidly restored. 2. Optic atrophy resulted from compression of the optic canal, which was due to steeple skull on a basis of congenital syphilis. Autopsy showed a very small anterior fossa, orbits and optic canals, unusually marked impressions digitatae of the skull and many bony protuberances, cristae and sharp exostoses in the interior, a prominence [sic] in the interior of the middle fossa, with many dehiscences in the bones, changes in the sella turcica and anomalies in the cranial measurements. Chaos reigns in the diagnosis and treatment of the rhinogenous forms. 3. Slight monocular papilledema, with blindness, occurred in two cases. Vision cleared completely in one case; in the other, a paracentral scotoma including the blind spot was produced under continuous epinephrine anemia of the nasal mucosa. 4. Optic neuritis disappeared after ethmoidectomy, leaving a paracentral blind spot scotoma which was present several months after the operation. Two cases of complete blindness in optic neuritis, following acute general intoxication, cleared up, in one case by central, and in the other by peripheral, vision, so that in the progress toward recovery one showed a definite absolute central scotoma and the other concentric contraction of the peripheral field of vision.

SOME CASES OF OCULAR SYNKINESIA. DR. COPPEZ, Brussels, Belgium.

1. One case showed the pseudosign of Graefe (Fuch's sign). 2. There were two cases of congenital absence of lateral motility, complicated by enophthalmos, elevation of the globe and narrowing of the lid fissure in forced adduction (syndrome of Stilling). 3. A case of associated movements of the levator palpebrae with the muscles of mastication (syndrome of Marcus Gunn) was reported. 4. A patient showed contraction of the orbicularis palpebrarum when he smiled or showed his teeth. The same facial synkinesia (syndrome of Hitzig) appeared with chewing.

HYDATID CYSTS OF THE ORBIT: THREE CLINICAL CASES. DR. MARQUEZ, Madrid, Spain.

These parasitic masses are often difficult to diagnose, giving all the symptoms generally noted in orbital tumors. Pain, although occasionally absent, is most significant, appears suddenly and is probably due to the irritating action of the cyst fluid spreading to adjacent tissues and producing symptoms of allergy, just as it does after puncture of the cyst wall. For this reason puncture of the cyst has been warned against. The author, on the contrary, warmly commends it. He advises one to follow aspiration in the case of positive findings, with the injection of a solution of corrosive mercuric chloride, repeating the procedure two or

three days later, after the aseptic inflammation has developed, which facilitates the extrusion of the cyst membrane proper. Total extirpation is decidedly inadvisable, as it has been followed, in a number of cases, by blindness due to neuroparalytic keratitis. Krönlein's operation is required only in exceptional cases in which the cyst is located between the globe and the outer wall of the orbit, and the external orbitotomy of Rollet and of Terson is sufficient. In one of the cases radium was used for a supposed orbital sarcoma and caused a rapid increase in size of the mass, necessitating immediate operation, which then showed the true nature of the case (hydatid cyst). Conversely, a condition diagnosed as a cyst on account of positive laboratory observations (Weinberg and Cassoni reactions and eosinophilia) turned out to be a sarcoma. Even when these tests are negative, the possibility of hydatid cyst should be borne in mind. The result of an exploratory puncture is almost the only reliable indication, because of the nature of the aspirated fluid, which at times, though not always, contains the hooklets of Taenia echinococcus, often quite decomposed. The author discusses the constant, frequent and rare symptoms of this disease, and calls attention to the important contributions to this subject, by Spanish-American ophthalmologists, who have been somewhat ignored in the reviews.

Traumatic Word Blindness. Dr. Borel, Neufchâtel.

The author presented reminiscences of conversations with Pasteur, Dejerine, Charcot and the Pleiades of the great men of a past era, and of his finding, as chief of clinic to Landolt, the first case of traumatic alexia or verbal cecity: A silk designer suddenly noticed that he could not read, although he had not felt any malaise. He had lost memory for all conventional signs, letters, hours on a clock dial, musical notes, coins, bank bills, etc. There was bilateral hemichromatopsia. The following week, Charcot presented the patient at the Salpétrière and gave a memorable lecture. Later, autopsy by Dejerine showed a minute lesion in the left curved convolution (*pli courbé*). Borel reports the still more unusual case of pure traumatic alexia following a fall from a bicycle, with loss of the reading faculty and of memory of all conventional signs. He discusses the psychology of alexics, which has already been described by Pierre Marie (*Les maladies du langage*). In the second case the sense of taste, too, was lost, as in a similar case, but the field of vision was intact.

Value of Globular Sedimentation in Ophthalmoscopy. Dr. Viallefont, Montpellier.

The speed of sedimentation was tested in 199 cases of ocular disease, confirming accepted views and previous reports. The ocular processes act only by the intermediary of a general process. The diagnostic value of the reaction is manifest in patients with rheumatism or syphilis who have not been subjected to treatment. In inflammations, its value is chiefly prognostic. The sedimentation rate is not affected in cataract, glaucoma, detachment or hemorrhage into the vitreous. Before operation, this reaction may reveal a latent infection and thus be of real value.

LACTOPROTEIN INJECTIONS IN OCULAR INFECTIONS. DR. LACAT, Paris.

The author has had surprisingly rapid results in 260 patients, most of whom had been under treatment for a long time by the usual methods without any benefit. Intramuscular injections were given in serious ocular conditions, such as infected ulcer with hypopyon, ulcerative, pustular keratoconjunctivitis, episcleritis, iritis and postoperative suppuration, and confirmed the laudatory statements of previous authors. These injections not only relieve symptoms promptly, but assure a complete cure which is not less prompt, and should be used on every possible occasion.

A NEW UNBREAKABLE CORRECTING GLASS. DR. BICHELONNE, Paris.

This new glass, the Aclastes, was studied as to its correcting power. Pollak found no absorption band in the yellow of the spectrum. Research by Petrignani (Hôpital Necker) and the author showed that this glass has the same correcting power as ordinary lenses and can be prescribed from the standpoint of optics with all security. Bichelonne also demonstrated the experimental method used by Benoist-Berthiot to determine the curvature of surface of Orthal toric lenses. Compared with spherocylinders with a 6 diopter base, these lenses show a minimum variation of astigmatism with an oblique line of vision.

Additional papers were read and lantern slides projected as follows:

CASE OF PROLIFERATING CONJUNCTIVITIS SUCCESSFULLY TREATED BY DIATHERMY-COAGULATION. DR. NIDA and DR. MARTERET, Paris.

HETEROCHROMIA IRIDIS AND TUBERCULOSIS. DR. ROSSI, Modena, Italy.

PARALYZING INJECTION INTO THE SUPERIOR RECTUS AND LEVATOR, PREOPERATIVELY. DR. BOURDIER, Paris.

HESITATION IN CATARACT OPERATIONS. DR. DEL ROY ALMENDROS, Valencia, Spain.

THE NERVES OF THE CHOROID. DR. TEULIÈRES and DR. BEAUVIEUX, Bordeaux.

PERIPHERAL CHORIORETINITIS IN THE COURSE OF HEREDITOSYPHILITIC INTERSTITIAL KERATITIS. DR. CHAILLOUS, Paris.

STUDIES OF THE RETINAL FLUID. DR. MAGITOT and DR. LENOIR, Paris.

GLAUCOMA AND MEAN PRESSURE. DR. SAINT-MARTIN, Toulouse.

NATURE AND MEDICOSURGICAL TREATMENT OF GLAUCOMA. DR. TERSON, Paris.

LATE RESULTS OF SCLEROCORNEAL FISTULIZATION. DR. ONFRAY and DR. ABELOOS, Paris.

"BRIDLED" TENOTOMY FOR STRABISMUS. DR. ALEXIADES, Constantinople, Turkey.

PULSATING EXOPHTHALMOS: LIGATION OF COMMON CAROTID; CURE. DR. PERRIN and DR. WERTHEIMER, Lyon.

EXPERIMENTAL AND CLINICAL STUDY OF PHOTOTHERAPY IN PNEUMOCOCCIC INFECTIONS. DR. GALLENGA, Turin, Italy.

RELATION OF THE TONSILS TO THE OCULAR APPARATUS. DR. WORMS, Paris.

Book Reviews

La terapia del distacco retinico idiopatico. By Dario Sabbadini. Communication to the Second Congress of the Italian Ophthalmological Society, Rome, 1931. Pp. 204. Rome: "L'Universale" Tipografia Poliglotta, 1932.

The author, after reporting the cases of thirty-nine patients with retinal detachment treated before the time of Gonin's operation and those of seventy-two patients treated according to Gonin's method, came to the following conclusions:

I. A consideration of the organic causes of retinal detachment is necessary before the application of adequate therapy. Every oculist who observes a retinal detachment should remember that he is dealing with a diseased body and that his task should not be limited to a verification of the extent of the detachment, of retinal tears, a clouding of the vitreous, hypotension or hemorrhages, but that it should be extended to an accurate history, laboratory tests and clinical examinations. Neither surgical treatment nor medical treatment alone is capable of permitting a true evaluation of *relapses* (relapse is synonymous with the persistence of a cause), or of a new method of treatment.

1. Before undertaking to treat locally a so-called idiopathic detachment of the retina, it is necessary to establish what disease or organic dysfunction is the prime cause.

2. According to the gravity of the case, general treatment should precede any intervention on the globe, and should also be continued during the postoperative course.

3. In every case (even in those surgically cured), the general treatment should continue for a long time after operation, in order to eliminate one of the principal reasons for a recurrence of the detachment.

II. Are local surgical methods to be preferred in view of a wider experience or because they respond to simple surgical postulates?

Today every one recognizes in the method of Gonin the most important surgical method; it is not necessary to repeat the differential characteristics between this and other methods, especially that of Sourdille. After Gonin's great discovery some writers are hastening to modify, not the concept (because this remains unshaken and not easily attacked), but the form of surgical application for the "closure of a retinal tear," in order to acquire a merit that seems relative. Therefore:

1. The method of Gonin is today preferable to any other local surgical method.

2. It has been demonstrated that Gonin's operation is developed from a well defined conception, and that, applied with this in view, it has met the demands of its author.

3. To speak of Gonin's operation is not exact; it is better to speak of "Gonin's surgical principle."

4. This consists in emphasizing the necessity of closing a retinal tear in order to obtain healing of an idiopathic retinal detachment.

5. Any other local method (medical or surgical) has value only as an adjuvant to perforating thermocauterization (e. g., subconjunctival injections of saline solutions, the "colmatage" of Lagrange, etc.), or as a modification of the original method (the method of Guist, of Weve, methods that employ irritating chemical substances).

III. What other methods may be utilized, even if not in direct surgical attack, as adjuvants, and at what time shall they be used?

The medical and surgical methods referred to in the fifth conclusion of the preceding section may be divided into two groups:

(*A*) Scleral paracentesis of Ware-Sichel may be utilized with success to facilitate that transitory retinal reapplication which is apt to reveal and localize a tear; this, utilized by Gonin in various cases and by all the other writers who have used Gonin's method, may be said never to have failed the aforementioned purpose; however, it seems to be recommended but little (Gonin), especially in those cases of inveterate detachment in patients operated on by Gonin's method in which small inferior folds persist, although the tear is closed, and in which the operator wishes to cure even this minimal remnant of detachment.

Subconjunctival injections of saline solutions act by stimulating both the uveal function and the absorption of turbid fluid in the interior of the globe and in the subretinal space. The solution (of from 3 to 5 per cent strength) should be used not only before intervention on the tear (Gonin), but especially afterward, and particularly in cases of small persisting folds of detachment or even of vitreous turbidity.

The "colmatage" of Lagrange has been used after Gonin's operation by Lowenstein only. So far as I have been able to learn, it has not been used after other operations for detachment. Since Lagrange himself declares that it is not to be employed except to raise the intra-ocular tension, it might, in my judgment, be used in those cases wherein, though one has attained a surgical closure of the tear, a hypotension persists, a sign of grave disturbance of ciliary function and of grave prognostic significance.

(*B*) Regarding other methods employed as a modification of Gonin's original procedure, I desire to quote Gonin's most recent conclusions:

1. "Posterior galvano-cauterization of Lindner can be tried in tears very far back or even macular."

2. "Diathermocoagulation after the manner of Weve, i. e., of or on the tear, and not, as is done by Larsson, over a large surface and not on the tear, can be employed in very extensive tears."

3. "Chemical agents (mercury cyanide according to Sourdille, potassium hydrate according to Guist) may replace the incandescent point, especially in those cases with multiple tears situated over a large area."

4. To the foregoing I should add a procedure that is innocuous and simple, and which has not yet been adopted: I mean unipolar electrolysis after the manner of Marval and of Verhoeff, which, besides the advantages mentioned, has the important one of controlling the position

of the point of the electrolyzing needle in the interior of the globe. Certainly for this purpose one should use needles the curve of which is adaptable to the curvature of the scleral surface. Thus, one may obtain a simplification of the well known maneuver of Arruga's nail.

5. I should propose a wider use of diathermocoagulation even on medium-sized and small tears.

IV. Cures obtained by methods other than those indicated in II and the so-called spontaneous cures are next considered.

What may one conclude regarding cures obtained by methods other than those used by Gonin? Almost every writer has cited the cases of patients who were cured and observed for various years. One may say that either with simple subconjunctival injections of saline or with more complex methods, e. g., those of Dor, Holt, Muller and Deutschmann, cures have been reported, though rarely. However, in the present state of knowledge of the mechanism of healing of detachments, mantaining the principle of closure of retinal tears as fundamental, one should consider only those cases in which a cure has been obtained, and in which before applying a method other than Gonin's, the tear has been recognized. The cases in which cures have been obtained by an operation outside the seat of the tear must, in addition, be studied for after-effects or modifications in the tear itself. These are tenets to be observed. In conclusion, what happens to the retinal tear in the idiopathic detachments cured by interventions that have not involved the tear itself? Does it close spontaneously? Cases studied from this point of view are rare, and in scientific work, where it is recognized that there is a possibility of studying them, there is complete or almost complete silence on such an important question. Typical among these are certain cases cited in the last publication of Sourdille, Jr. In more than a hundred cases studied by me systematically, I have been able to collect only four to comfort me in the possible solution of this problem (the first four cases cited in this work).

One must therefore come to the following conclusions:

1. Those cases of cure obtained by other methods preceding Gonin's method and not done with that conception probably took place by virtue of a spontaneous or accidentally provoked closure of the retinal tear unidentified before the therapeutic application.

2. Spontaneous closure of a tear and the consequent healing of the detachment are possible.

3. It is also possible to facilitate closure of a tear by operating near it, either by perforating cauterization or by other methods that provoke an adhesive choroidal reaction (see the observations of Lindner, of Gonin, the important ones of Muller and my personal cases, chap. 6, par. 6).

4. Those cases of cure obtained by other methods, contemporaneous with that of Gonin but substantially different from it (Sourdille), must be explained (as Gonin states) as an accidental closure of unrecognized retinal tears, the importance of which was neglected or overlooked. This happened because the therapeutic agent was effective in the neighborhood of the tear itself.

5. To speak of spontaneous cures in a strict sense, one should cite cases in which no other treatment save rest is used. Such cases when

cited in the literature are detachments from exudation or transudation (albuminuric, gravidic) rather than idiopathic cases; however, when spontaneous healing of an idiopathic tear takes place, one must of necessity explain the mechanism as one of spontaneous closure of a retinal tear.

6. In view of the International Congress of Madrid, in 1933, it is to be hoped that cases will be collected which will explain the fate of retinal tears in patients operated on at a distance from the tear itself, and cases in which a spontaneous cure occurred. V. R. SYRACUSE.

Bildersehprobe für die Nähe. By Prof. W. Löhlein, Jena. Price, 9.60 marks. Three plates. Munich: J. F. Bergmann, 1930.

It is sometimes necessary to test the near vision of children and analphabets. For this Löhlein has devised three plates with pictures, Snellen's hooks and Landolt's rings. The plates are excellently printed in dull black on opaque heavy white paper, and are suitably contained in a pocket folder. A. K.

Directory of Ophthalmologic Societies *

INTERNATIONAL

International Association for Prevention of Blindness

President: Prof. F. de Lapersonne, 217, Faubourg St. Honoré, Paris.
Secretary-General pro tem.: Dr. A. Churchill, 66, Boulevard St. Michel, Paris.

International Ophthalmologic Congress

Secretary: Dr. Francisco Poyales, Olozaga 3, Madrid.
Place: Madrid. Time: April 16-22, 1933.

FOREIGN

British Medical Association, Section on Ophthalmology

President: Sir J. Herbert Parsons, 54 Queen Anne St., Cavendish Square, London, W. I.

Ophthalmological Society of Bombay

President: Dr. D. D. Sathaye, 127 Girgoam Road, Bombay 4.
Secretary: Dr. C. R. Athawale, Bhatwadi Girgoam, Bombay 4.
Place: A. M. C. Free Ophthalmic Hospital Bldg., Poi Bawadi Parel, Bombay 12.
Time: First Friday of every month.

Ophthalmological Society of the United Kingdom

President: Mr. A. H. H. Sinclair, 6 Charlotte Square, Edinburgh.
Secretary: Mr. Humphrey Neame, 56 Portland Place, London, W. I.

Oxford Ophthalmological Congress

Master: Dr. Cyril Walker, Bristol, England.
Secretary: Dr. C. G. Russ Wood, Hill House, Abberbury Rd., Iffley, Oxford, England.

Royal Society of Medicine, Section of Ophthalmology

President: Dr. E. W. Brewerton, 73 Harley St., W. 1, London.
Secretary: Dr. P. G. Doyne, 60 Queen Anne St., W. 1, London.

Société Française d'Ophthalmologie

Secretary: Dr. René Onfray, 6 avenue de la Motte Picquet, Paris 7è.

German Ophthalmological Society

Secretary: Prof. A. Wagenmann, Heidelberg.

NATIONAL

American Medical Association, Section on Ophthalmology

Chairman: Dr. Frederick H. Verhoeff, 82 Commonwealth Ave., Boston.
Secretary: Dr. Parker Heath, 1551 Woodward Ave., Detroit.
Place: Milwaukee. Time: June 12-16, 1933.

American Academy of Ophthalmology and Oto-Laryngology

President: Dr. S. Hanford McKee, 1528 Crescent St., Montreal, Canada.
President-Elect: Dr. B. R. Shurley, 62 W. Adams Ave., Detroit.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.

American Ophthalmological Society

President: Dr. Thomas B. Holloway, 1819 Chestnut St., Philadelphia.
Secretary-Treasurer: Dr. J. Milton Griscom, 2213 Walnut St., Philadelphia.
Place: Washington, D. C. Time: May 8-10, 1933.

* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

SECTIONAL

New England Ophthalmological Society

President: Dr. David W. Wells, Hotel Westminster, Boston.
Secretary-Treasurer: Dr. Theodore L. Terry, 243 Charles St., Boston.
Place: Massachusetts Eye and Ear Infirmary, 243 Charles St., Boston. Time: 8 p. m., third Tuesday of each month from November to April, inclusive.

Pacific Coast Oto-Ophthalmological Society

President: Dr. Hans Barkan, 490 Post St., San Francisco.
Secretary-Treasurer: Dr. J. Frank Friesen, 1208 Roosevelt Bldg., Los Angeles.
Place: San Francisco. Time: 1933.

Puget Sound Academy of Ophthalmology and Oto-Laryngology

President: Dr. John H. Harter, 1215 Fourth Ave., Seattle.
Secretary-Treasurer: Dr. Francis A. Brugman, 806 Cobb Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

Saginaw Valley Academy of Ophthalmology and Otolaryngology

President: Dr. R. B. Smith, Alma, Mich.
Secretary-Treasurer: Dr. W. K. Slack, 308 Eddy Bldg., Saginaw, Mich.
Place: Saginaw, Mich., or Bay City, Mich. Time: First Friday of each month, except July and August.

Sioux Valley Eye and Ear Academy

President: Dr. John B. Gregg, 101 S. Main St., Sioux Falls, S. Dakota.
Secretary-Treasurer: Dr. F. H. Roost, 420 Trimble Bldg., Sioux City, Iowa.

Southern Medical Association, Section on Eye, Ear, Nose and Throat

Chairman: Dr. William D. Gill, 323 Medical Arts Bldg., San Antonio, Texas.
Secretary: Dr. William A. Wagner, 914 American Bank Bldg., New Orleans.
Place: Richmond, Va. Time: November, 1933.

Southwestern Michigan Triological Society

President: Dr. W. E. McGarvey, 802 Jackson City Bank Bldg., Jackson.
Secretary: Dr. Don C. Lyons, 1405 Union and Peoples National Bank Bldg., Jackson.
Time: Third Thursday of alternate months.

STATE

Colorado Ophthalmological Society

President: A presiding officer is selected for each meeting alternately until all members have served.
Secretary: Dr. Ralph W. Danielson, 258 Metropolitan Bldg., Denver.
Place: Capitol Life Building, Denver. Time: 7:30 p. m., third Saturday of the month, October to April, inclusive.

Connecticut State Medical Society, Section on Eye, Ear, Nose and Throat

President: Dr. M. H. Gill, 36 Pearl St., Hartford.
Secretary-Treasurer: Dr. Walter L. Hogan, 750 Main St., Hartford.
Time: May, November.

Eye, Ear, Nose and Throat Club of Georgia

President: Dr. Thomas H. Hall, Jr., 617 Mulberry St., Macon.
Secretary-Treasurer: Dr. J. A. Smith, 700 Spring St., Macon.

Indiana Academy of Ophthalmology and Oto-Laryngology

President: Dr. J. R. Gillum, 221 S. Sixth St., Terre Haute.
Secretary: Dr. J. Kent Leasure, 23 E. Ohio St., Indianapolis.

IOWA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY
President: Dr. W. W. Pearson, 410 Sixth Ave., Des Moines.
Secretary-Treasurer: Dr. W. F. Boiler, 105 E. Iowa Ave., Iowa City.

MICHIGAN STATE MEDICAL SOCIETY, SECTION OF OPHTHALMOLOGY AND OTOLARYNGOLOGY
Chairman: Dr. Wilfred Haughey, 303 Post Bldg., Battle Creek.
Secretary: Dr. H. O. Westervelt, 239 Pipestone St., Benton Harbor.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY
President: Dr. Harold J. Rothschild, 239 Lowry Bldg., St. Paul.
Secretary-Treasurer: Dr. Walter E. Camp, Medical Arts Bldg., Minneapolis.
Time: Second Friday of each month from October to May.

MONTANA ACADEMY OF OTO-OPHTHALMOLOGY
President: Dr. L. H. Huber, Livingston.
Secretary: Dr. A. W. Morse, Phoenix Bldg., Butte.

NEW JERSEY STATE MEDICAL SOCIETY, SECTION ON OPHTHALMOLOGY, OTOLOGY AND RHINOLARYNGOLOGY
Chairman: Dr. Charles H. Schlichter, 556 N. Broad St., Elizabeth.
Secretary: Dr. B. E. Failing, 31 Lincoln Park, Newark.

NEW YORK STATE MEDICAL SOCIETY, EYE, EAR, NOSE AND THROAT SECTION
Chairman: Dr. D. F. Gillette, 109 S. Warren St., Syracuse.
Secretary: Dr. Frank M. Sulzman, 1831 Fifth Ave., Troy.

NORTH DAKOTA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY
President: Dr. Axel Oftedal, 55½ Broadway, Fargo.
Secretary-Treasurer: Dr. F. L. Wicks, 516 Fourth St., Valley City.

OREGON ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY
President: Dr. A. B. Dykman, Medical Dental Bldg., Portland.
Secretary-Treasurer: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

RHODE ISLAND OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETY
President: Dr. Herman A. Winkler, 224 Thayer St., Providence.
Secretary: Dr. N. A. Bolotow, 108 Waterman St., Providence.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

SOUTH CAROLINA MEDICAL ASSOCIATION, SECTION ON OPHTHALMOLOGY AND OTOLARYNGOLOGY
President: Dr. W. B. McWhorter, 106 E. Earle St., Anderson.
Secretary-Treasurer: Dr. G. M. Truluck, Orangeburg.
Time: April and December.

TEXAS OPHTHALMOLOGICAL AND OTO-LARYNGOLOGICAL SOCIETY
President: Dr. W. D. Jones, 3116 Live Oak St., Dallas, Texas.
Secretary: Dr. A. F. Clark, 1034 Nix Professional Bldg., San Antonio.

UTAH OPHTHALMOLOGICAL SOCIETY
President: Dr. D. W. Henderson, 75 S. Main St., Salt Lake City.
Secretary-Treasurer: Dr. T. F. Welch, 14 Exchange Pl., Salt Lake City.

VIRGINIA SOCIETY OF OTO-LARYNGOLOGY AND OPHTHALMOLOGY
President: Dr. Frank P. Swart, 142 W. York St., Norfolk.
Secretary-Treasurer: Dr. H. G. Preston, 307 Professional Bldg., Harrisonburg.

WEST VIRGINIA STATE MEDICAL ASSOCIATION, EYE, EAR, NOSE AND THROAT SECTION
President: Dr. O. H. Bobbitt, Medical Arts Bldg., Charleston.
Secretary: Dr. Harry V. Thomas, 95 Fairmont Ave., Fairmont.

LOCAL

Academy of Medicine of Northern New Jersey, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Elbert A. Curtis, 65 Central St., Newark.
Secretary: Dr. A. Russell Sherman, 671 Broad St., Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

Academy of Medicine of Toronto, Section of Ophthalmology

Chairman: Dr. P. J. F. Houston, 34 Hurndale Ave., Toronto.
Secretary: Dr. Alexander E. MacDonald, 151 Bloor St., W., Toronto.
Time: First Monday of winter months.

Atlanta Eye, Ear, Nose and Throat Society

President: Dr. L. C. Rouglin, 127 Peachtree St., N. E., Atlanta, Ga.
Secretary: Dr. William O. Martin, Jr., Medical Arts Bldg., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: 8 p. m., last Thursday of each month.

Baltimore Medical Society, Section on Ophthalmology

Chairman: Dr. Harry Friedenwald, 1212 Eutaw Pl., Baltimore.
Secretary: Dr. William M. Rowland, 906 Cathedral St., Baltimore.
Place: Medical and Chirurgical Faculty, 1211 Cathedral St. Time: 8:30 p. m., fourth Thursday of each month from October to May.

Brooklyn Ophthalmological Society

President: Dr. W. F. C. Steinbugler, 515 Ocean Ave., Brooklyn.
Secretary: Dr. Walter V. Moore, 1 Nevins St., Brooklyn.
Place: Kings County Medical Society Bldg., 1313 Bedford Ave. Time: Third Thursday in February, April, May, October and December.

Buffalo Ophthalmologic Club

President: Dr. H. D. Andrews, 33 Allen St., Buffalo.
Secretary-Treasurer: Dr. Thurber Le-Win, 112 Linwood Ave., Buffalo.

Chicago Ophthalmological Society

President: Dr. Michael Goldenburg, 104 S. Michigan Ave., Chicago.
Secretary: Dr. Richard C. Gamble, 30 N. Michigan Ave., Chicago.
Place: Medical and Dental Arts Club. Time: Third Monday of each month from October to May.

Cleveland Academy of Medicine, Section of Ophthalmology and Oto-Laryngology

Chairman: Dr. M. W. Jacoby, 2323 Prospect Ave., Cleveland.
Secretary: Dr. H. C. Rosenberger, 1065 Rose Bldg., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

Cleveland Ophthalmological Club

Chairman: Dr. Roy B. Metz, Hanna Bldg., Cleveland.
Secretary: Dr. Paul G. Moore, Medical Arts Bldg., Cleveland.

College of Physicians, Philadelphia, Section on Ophthalmology

Chairman: Dr. L. F. Appleman, 308 S. Sixteenth St., Philadelphia.
Clerk: Dr. Alexander G. Fewell, 1924 Pine St., Philadelphia.
Time: Third Thursday of every month from October to April, inclusive.

Columbus Ophthalmological and Oto-Laryngological Society

Chairman: Dr. John B. Alcorn, 167 E. State St., Columbus, Ohio.
Secretary-Treasurer: Dr. Edward W. Harris, 681 E. Broad St., Columbus, Ohio.
Time: First Monday of each month.

Dallas Academy of Ophthalmology and Oto-Laryngology

President: Dr. O. M. Marchman, 1717 Pacific Ave., Dallas, Texas.
Recording Secretary: Dr. W. Mood Knowles, 1717 Pacific Ave., Dallas, Texas.
Corresponding Secretary: Dr. J. M. Potts, 1717 Pacific Ave., Dallas, Texas.
Place: Dallas Athletic Club. Time: 6:30 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Des Moines Academy of Ophthalmology and Otolaryngology

President: Dr. Cecil C. Jones, 1121 Equitable Bldg., Des Moines, Iowa.
Secretary-Treasurer: Dr. Grace Doane, 614 Bankers Trust Bldg., Des Moines, Iowa.
Time: 7:45 p. m., third Monday of every month, September to May.

Detroit Ophthalmological Club

Chairman: Members rotate alphabetically.
Secretary: Dr. Raymond S. Goux, David Whitney Bldg., Detroit.
Time: 6:30 p. m., first Wednesday of each month.

Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. R. H. Seeley, 9 Court St., Rutland, Vt.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.
Time: Third Wednesday in October, November, March, April, May and June.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. R. H. Needham, 1304 Medical Arts Bldg., Fort Worth, Texas.
Secretary-Treasurer: Dr. Van D. Rathgeber, 1011 Medical Arts Bldg., Fort Worth.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

Grand Rapids Eye, Ear, Nose and Throat Society

President: Dr. Carl F. Snapp, 26 Sheldon Ave., Grand Rapids, Mich.
Secretary-Treasurer: Dr. Walter W. Oliver, 26 Sheldon Ave., Grand Rapids, Mich.
Place: Various local hospitals. Time: Third Thursday of alternating months, September to May.

Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. L. W. Raney, 609 Fannin St., Houston, Texas.
Secretary: Dr. J. F. Gamble, 201 Main St., Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. John W. Carmack, 23 E. Ohio St., Indianapolis.
Secretary: Dr. Kenneth L. Craft, 23 E. Ohio St., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

Kansas City Society of Ophthalmology and Oto-Laryngology

President: Dr. Albert N. Lemoine, 906 Grand Ave. ,Kansas City, Mo.
Secretary: Dr. Harold B. Hedrick, 618 Professional Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

Long Beach Eye, Ear, Nose and Throat Society

President: Dr. Ferris L. Arnold, 923 Security Bldg., Long Beach, Calif.
Secretary-Treasurer: Dr. Clyde E. Harner, 312 Security Bldg., Long Beach, Calif.
Place: Professional Bldg. Time: Last Wednesday of each month from September to June.

Los Angeles County Medical Society, Section on Ophthalmology and Oto-Laryngology

Acting President: Dr. D. E. Godwin, 910 Security Bldg., Long Beach, Calif.
Secretary-Treasurer: Dr. F. H. Brandt, 1052 W. Sixth St., Los Angeles.
Place: Elks Temple. Time: 6:30 p. m., fourth Monday of each month from September to May, inclusive.

Medical Society of the District of Columbia, Section of Ophthalmology and Oto-Laryngology

Chairman: Dr. Albert P. Tibbets, 1801 I St., Washington.
Secretary Dr. G. Victor Simpson, Rhode Island Ave., Washington.
Place: 1718 M St., N. W. Time: 8 p. m., third Friday of each month from October to April, inclusive.

Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month. Annual meeting, Jan. 10, 1933.

Milwaukee Oto-Ophthalmic Society

President: Dr. T. F. McCormick, 324 Wisconsin Ave., Milwaukee.
Secretary-Treasurer: Dr. O. P. Schoofs, 324 E. Wisconsin Ave., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.

Montreal Ophthalmological Society

President: Dr. J. P. E. Bousquet, 66 Sherbrooke St., West, Montreal, Canada.
Secretary: Dr. J. A. MacMillan, 1410 Stanley St., Montreal, Canada.
Time: Second Thursday of October, December, February and April.

Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. Hilliard Wood, 700 Church St., Nashville, Tenn.
Secretary-Treasurer: Dr. H. C. Smith, Medical Arts Bldg., Nashville, Tenn.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month.

New Orleans Ophthalmological and Otolaryngological Society

President: Dr. Charles A. Bahn, 150 Baronne St., New Orleans.
Secretary-Treasurer: Dr. M. F. Meyer, Canal Bank Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: Third Thursday of each month from October to June.

New York Academy of Medicine, Section of Ophthalmology

Chairman: Dr. Mark J. Schoenberg, 1160 Park Ave., New York.
Secretary: Dr. Algernon B. Reese, 73 E. Seventy-First St., New York.
Time: 8:30 p. m., third Monday of every month from October to May, inclusive.

Omaha and Council Bluffs Ophthalmological and Oto-Laryngological Society

President: Dr. L. G. Howard, 532 First Ave., Council Bluffs, Iowa.
Secretary-Treasurer: Dr. W. A. Cassidy, 1620 Medical Arts Bldg., Omaha.
Place: Omaha Club, 20th and Douglas Sts., Omaha. Time: 6 p. m., dinner; 7 p. m., program; third Wednesday of each month from October to May.

Pittsburgh Ophthalmological Society

President: Dr. Edward B. Heckel, Jenkins Arcade Bldg., Pittsburgh.
Secretary: Dr. George H. Shuman, Park Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine Bldg. Time: Fourth Monday of each month, except June, July, August and September.

Pittsburgh Slit-Lamp Society

President: Dr. W. W. Blair, 121 University Pl., Pittsburgh.
Secretary: Dr. George H. Shuman, Park Bldg., Pittsburgh.
Place: 121 University Pl. Time: Second Monday evening of every month, except June, July and September.

Richmond Ophthalmological and Oto-Laryngological Society

President: Dr. William R. Weisiger, Medical Arts Bldg., Richmond, Va.
Secretary: Dr. R. W. Vaughan, Medical Arts Bldg., Richmond, Va.
Place: Westmoreland Club. Time: 6 p. m., second Monday of each month from October to May.

Rochester Eye, Ear, Nose and Throat Society

Chairman: Dr. E. S. Amsler, 53 S. Fitzhugh St., Rochester, N. Y.
Secretary-Treasurer: Dr. E. W. O'Brien, 5 N. Goodman St., Rochester, N. Y.
Place: Rochester Medical Association, 113 Prince St. Time: 8 p. m., third Monday of each month from October to May.

St. Louis Ophthalmic Society

President: Dr. Julius H. Gross, Carleton Bldg., St. Louis.
Secretary: Dr. Carl T. Eber, 1006 Carleton Bldg., St. Louis.
Place: Oscar Johnson Institute. Time: Clinical meeting 5:30 p. m., dinner and scientific meeting 6:30 p. m., fourth Friday of each month from October to April, inclusive, except December.

San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. Charles J. Boehs, Medical Arts Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. E. D. Dumas, 425 Medical Arts Bldg., San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

San Francisco County Medical Society, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Robert C. Martin, 384 Post St., San Francisco.
Secretary: Dr. George N. Hosford, 490 Post St., San Francisco.
Place: Society's Building, 2180 Washington St., San Francisco.
Time: Third Tuesday of every month except May, June, July and December.

Shreveport Eye, Ear, Nose and Throat Society

President: Dr. J. L. Scales, Medical Arts Bldg., Shreveport, La.
Secretary-Treasurer: Dr. W. L. Atkins, 505 Medical Bldg., Shreveport, La.
Place: 1240 Texas Ave. Time: 7:30 p. m., first Monday of each month from October to June.

Spokane Academy of Ophthalmology and Oto-Laryngology

President: Dr. David Hartin, Old National Bank Bldg., Spokane, Wash.
Secretary: Dr. W. W. Henderson, Paulsen Medical and Dental Bldg., Spokane, Wash.
Place: Paulsen Medical and Dental Library. Time: 8 p. m., fourth Tuesday of each month except June, July and August.

Syracuse Eye, Ear, Nose and Throat Society

President: Dr. W. G. Dickinson, 504 State Tower Bldg., Syracuse, N. Y.
Secretary-Treasurer: Dr. Harold H. Joy, 504 State Tower Bldg., Syracuse, N. Y. N. Y.
Place: University Club. Time: Second Friday of each month except June, July and August.

Tulsa Academy of Ophthalmology and Otolaryngology

President: Dr. Roy Dunlap, 108 W. Sixth St., Tulsa, Okla.
Secretary-Treasurer: Dr. Marvin D. Henley, 108 W. Sixth St., Tulsa, Okla.
Place: Medical Arts Bldg. Time: Monthly.

INDEX TO VOLUME 8

The asterisk (*) preceding the page number indicates an original article in the Archives. Subject entries are made for all articles and society transactions. Book Reviews, Obituaries, and Society Transactions are indexed under these headings in their alphabetical order under the letters B, O, and S, respectively.

Abnormalities: See under names of diseases and organs

Abraham, S. V.: Chorioretinitis juxtapapillaris (Jensen); first histologic report, *503

Accommodation, disagreement of two eyes in reading, 770

mechanism of accommodation studied experimentally, *53

problem of accommodation and changes of refraction, 291, 465, 466

Acetarsone, optic atrophy consequent on treatment with stovarsol for dementia paralytica, 944

Adelman, B. B.: Use of potassium hydroxide sticks in Guist operation for detachment of retina, *92

Adenocarcinoma, primary, of orbit, 915

Adrenalin: See Epinephrine

Aebli, R.: Muscle cases, 301

Allen, G.: Radium therapy in New York Eye and Ear Infirmary, 305

Allergy: See Anaphylaxis

Amblyopia: See Blindness

American Board for Ophthalmic Examinations, next examination, 123

Medical Association, scientific exhibit at Milwaukee, 900

Amyl nitrite treatment of retinitis pigmentosa after method of Imre, 471

Anaphylaxis, allergic investigations in 23 cases of vernal conjunctivitis, 619

Anesthesia, iris anesthesia by retrobulbar injection and paralysis of orbicularis oculi by seventh nerve block, 769

local, critical survey of old and new preparations, 609

local, in ophthalmology, 777

Aneurysms, retinitis proliferans and multiple aneurysms, 293

Angina capitis, 610

Angioid streaks of retina and pseudoxanthoma elasticum, *334

Angioma of choroid, 296

venous angioma of retina, optic nerve, chiasm and brain; case report with postmortem observations, *871

Aniridia: See Iris

Anophthalmos: See Eye, absence of

Aphasia, visual, traumatic, 946

Apiol poisoning, retrobulbar neuritis from, 913

Apparatus: See also Instrument

electric ophthalmoscope, 284

operating table for animal experiments, *93

reflecting prism-lens for slit-lamp microscopy of retina, *274

Aqueous Humor, circulation of, importance of optic nerve, 783

circulation of, mechanism of reabsorption of fluid, *9

diffusion of hemoglobin in aqueous, vitreous and blood serum, 290

Argyrosis: See under Silver

Arteriosclerosis, hypertension and nephritis, 763

Artery, retinal, mean tension of central retinal artery, 944

retinal, significance of diastolic obliteration of, 943

Atkinson, W. S.: Retinitis punctata albescens, report of 2 cases in which the dots disappeared, *409

Atrophy, gyrate atrophy of choroid and retina (Fuchs), *372

Optic: See Nerve, optic

Atropine and homatropine cycloplegia, 120

Bacteriophage in ophthalmology, preliminary report, *683

Badot: Ocular symptoms in heredofamilial craniofacial dystosis, 943

Baer, B. F., Jr.: Sarcoma of choroid; clinicopathologic contribution, 148

Baillart: Mean tension of central retinal artery, 944

Ballantyne, A. J.: Senile cataract; preoperative and postoperative management and complications, 624

Barraquer: Accidents and complications in total extraction of cataract, 940

Baudot: Retinal tears without appreciable detachment, 941

Baurmann: Research on structure of vitreous, 927

Beach, S. J.: Premonitory edema of lid in typhoid group, 780

Bedell, A. J.: Mooren's ulcer, 782; correction, 901

Significance of choroidal hemorrhage, *186

Bees, lesions of eye caused by stings of bees and wasps; report of cases, 605

Belgelman, M. N.: Elephantiasis of eyelid, *218

Benedict, W. L.: Foreign proteins and gold in treatment of uveitis, *250

Berens, C.: Circulation of aqueous humor; importance of optic nerve, 783

Resection operation for strabismus, *321

Berliner, M. L.: Transportation of particulate matter from vitreous into optic nerve, *695

Bichelonne: New unbreakable correcting glass, 947

Billingsley, J. A.: Tumor of pituitary body with terminal meningitis, 304

Biomicroscopy of vitreous, 940

Bismuth, can bismuth alone be sufficient in treatment of syphilis of eye? 298

massage with bismuth oxyiodide gallate in trachoma, 913

Blake, E. M.: Repair following operations on extra-ocular muscles; histologic observations, *711

Blepharitis: See under Eyelids

Blindness, treatment of toxic amblyopia with vasodilators, 304

vitreous hemorrhage with blindness, use of intra-orbital cautery, 775

Blood, chemical composition of blood and spinal fluid in primary glaucoma; comparative studies, *39

diffusion of hemoglobin in aqueous, vitreous and blood serum, 290

precipitation test in ophthalmology, 457

pressure, high, arteriosclerosis and nephritis, 763

Blue, R.: Case of cyanosis demonstrating circumcorneal veins, *94

Bone growth; ocular symptoms in heredofamilial craniofacial dysostosis, 943

Book Reviews:

Behandlung der Netzhautablösung mittels Diathermie; H. Weve, 480

Bildersehprobe für die Nähe; W. Löhlein, 951

Cirurgia Ocular. Volume 1; Ten Years of Specialized Surgery; W. B. Mattos, 313

Collected Reprints from Wilmer Ophthalmological Institute of Johns Hopkins University and Hospital, 481

Experimental Study of Reading; M. D. Vernon, 312

Intrakapsulare Starextraktion; A. Elschnig, 627

Kurzes Handbuch der Ophthalmologie; F. Schieck and A. Brückner, 789

Lehrbuch und Atlas der Spaltlampenmikroskopie des lebenden Auges: Part II. Linse und Zonula; A. Vogt, 308

Proceedings of All-India Ophthalmologic Society, volume 2, 789

Psychological Factors in Peripheral Vision; G. C. Grindley, 311

Report of Government Ophthalmic Hospital, Madras, India; R. E. Wright, 478

Röntgendiagnostik des Schädels bei Erkrankungen des Auges und seiner Nachbarorgane; R. Thiel, 309

Röntgendiagnostik und Therapie in der Augenheilkunde; Radiologische Praktika, vol. 19; W. Hoffmann, 312

Survey of Sight-Saving Classes in Public Schools of United States; E. T. Myers, 628

Terapia del distacco retinico idiopatico; D. Sabbadini, 948

Borel: Traumatic word blindness, 946

Bracken, F.: Detachment of retina with treatment by multiple ignipunctures, 305

Brain, abscess after lesion of skull and choked disk, report of case, 135

association of sclerosis of cerebral basal vessels with optic atrophy and cupping; report of 10 cases, *637

Brain—Continued

blood supply; cerebral blood flow and vasomotor response of minute vessels of human brain to histamine, 137

blood supply; respiratory quotient of brain and of extremities in man, 137

nevus flammeus of face and globe associated with glaucoma, vascular changes in iris and a calcified vascular growth in left occipital lobe of brain with right homonymous hemianopia, *365

venous angioma of retina, optic nerve, chiasm and brain; case report with postmortem observations, *871

von Buenau: Structure and consistency of vitreous, 928

Buphthalmos, congenital, hydrophthalmos, histologic changes, 944

with pseudoglioma of retina, 943

Cancer: See also Sarcoma; Tumor; and under names of special structures of eye, i. e., Orbit, cancer; etc.

epibulbar nevo-carcinoma with almost total corneal involvement, 613

metastatic, of optic disk, *226

Carroll, F. D.: Repair following operations on extra-ocular muscles; histologic observations, *711

Caruncle, telangiectodic granuloma in area of caruncle and tear sac, report of 2 cases, 468

Carvill, M.: Review of cases of patients with glaucoma admitted to Massachusetts Eye and Ear Infirmary over a period of 2 years, 778

Cataract, 907

and Raynaud's disease, 286

chronic eczema and cataract; report of case, 606

experimental cataract in vitamin G deficiency, *880

extraction, accidents and complications in, 940

extraction; from extracapsular to intracapsular extraction, 940

extraction; importance of slit-lamp examinations for prognosis in cataract extractions, 908

extraction, intracapsular, 766

extraction, intracapsular, wound closure for, *238

extraction; subsequent history of retained nucleus after cataract extraction, *441

extraction, tonometry before and after, 607

formation and photochemical effect of sulphydril compounds, 606

formation in mongolian idiocy, 133

histology of detachment of anterior capsular lamella of cataracts of blacksmiths and glass-blowers ("heat detachment" or solutio laminae capsulae anterioris), 461

parathyroid cataract, 766

senile, pathogenesis of, *97

senile, preoperative and postoperative management and complications, 624

spontaneous resorption of, 907

statistics of cataract extraction; extracts from official records of India office, *595

traumatic, treatment of, 133

uni-ocular zonular cataract, 906

Cauterization, effect of cauterization on regeneration, 920

Cellular permeability in relation to ophthalmology, *443

Cerebellum, retinitis combined with tumor of cerebellum (so-called Lindau or von Hippel's disease) and its relation to Coats' disease, 141

Cerebrospinal fluid, chemical composition of blood and spinal fluid in primary glaucoma, comparative studies, *39

Cerebrum: See Brain

Chan, E.: Pathogenesis of retinitis pigmentosa with note on phagocytic activity of Müller's fibers, *173

Chart, new international visual acuity chart, 614

Chloroma of orbit, report of case, 463

Choked Disk: See Papilledema

Cholesteatoma of orbit, 914

Choline, action of derivatives of choline on normal and pathologic eye, 458

Chorioretinitis juxtapapillaris (Jensen), first histologic report, *503

Choroid, angioma of, 296

cancer, bilateral, metastatic, 616

gyrate atrophy of choroid and retina (Fuchs), *372

hemorrhage, significance of, *186

hemorrhage, subchoroidal, diagnosed as sarcoma of choroid, report of case, *690

progressive atrophy of choroid with pigment degeneration of retina, report of cases, 140

sarcoma of, 618

sarcoma of, clinicopathologic contribution, 148

"smallest" sarcomas of choroid, 915

Choroiditis, acute nonpurulent diffuse exudative choroiditis (Harada's disease), 468

tuberculous, roentgenotherapy in, 920

Chromoretinography, 767

Ciliary Body, ophthalmotonic reactions experimentally produced by pricking ciliary body, 290

primary melano-carcinoma of, 143

projection of microscopic specimens illustrating hole in macula, lymph follicles in ciliary body and "posterior vortex veins," 300

Clapp, C. A.: Additional experiments verifying presence of Spirochaeta pallida in cornea in experimental interstitial keratitis, 782

Clark, J. S.: Purpura haemorrhagica of Schönlein-Henoch type, report of case, *649

Clausen: Operative treatment of detachment, 933

Clay, G.: Angioid streaks of retina and pseudoxanthoma elasticum, *334

Coats' Disease: See under Retina

Cohen, M.: Chemical composition of blood and spinal fluid in primary glaucoma; comparative studies, *39

Report of case of evisceration for hemorrhagic glaucoma with subsequent orbital melanosarcoma, and finally metastasis resulting in death, 779

Coloboma lentis with abnormal ciliary body, 762

Color photography of fundus oculi; description of new method, *405

sense, daltonism, 278

Congresses: See under Societies

Conjunctiva, diplobacillary infection, 600

gonorrhea; relation of conjunctival gonorrhea to genital gonorrhea, 601

natural immunity of conjunctiva after blocking reticulo-endothelial system with trypan blue, 600

nonoperative method of dilatation of conjunctival sac in anophthalmos, 608

tuberculosis, biomicroscopy in, 457

vital staining and biomicroscopy of conjunctiva, 935

Conjunctivitis, phlyctenular, and tuberculosis, 905

purulent, of new-born, 279

vernal, allergic investigations in 23 cases, 619

vernal, etiology and therapy of, 280

vernal; late vegetations with symblepharon in vernal catarrh, 935

vernal, observations on 87 cases at Wills Hospital (1929-1931), *380, 620

vernal, treatment for; light as determining cause of disease, 470

Constitution, study of human constitution for oculist, 303

Contact Glasses: See Glasses

Coppez: Dosage of transscleral diathermocoagulation with pyrometric electrode, 942

Ocular synkinesia, 945

Unilateral diplocoria with increased intraocular tension, 938

Cornea: See also Keratitis

annular interstitial infiltration of cornea in malignant lymphogranuloma, 905

atypical pigment line of cornea; biomicroscopic and histologic study, *847

blood-staining of cornea, 147

clinical and etiologic data of bilateral recurring abrasions of, 906

development of human cornea, *568

dystrophy, 145

epibulbar nevo-carcinoma with almost total corneal involvement, 613

formation of marginal furrows and ectasias of cornea, 127

herpes, various forms of, 936

nature of corneal pigment deposit in pseudosclerosis, 929

sensibility of, 936

sensibility of cornea in trachoma, 774

treatment of limbal tumors with radium, 775

ulcer, bilateral serpiginous ulcer with suppuration of lens and postoperative panophthalmitis, based on constitutional debility, 282

ulcer, internal, 126

ulcer, treatment of hypopyon ulcer by paracentesis with galvanocautery, 298

unusual corneal lesion, probably congenital and familial; a slit-lamp study, 783

Correction of Pascal's article "The Ioskiascopy Test" (Arch. Ophth. 7: 378 [March] 1932), 121

Correction—Continued
to Bedell's paper "Mooren's Ulcer" (Arch. Ophth. 8: 782 [Nov.] 1932), 901
to Wooton's article "Cyclodialysis Combined with Iridectomy" (Arch. Ophth. 8: 777 [Nov.] 1932), 902
Cowan, A.: An unusual corneal lesion, probably congenital and familial; a slit-lamp study, 783
Crigler, L. W.: Subchoroidal hemorrhage diagnosed as sarcoma of choroid; report of case, *690
Crystalline Lens: See Lens, Crystalline
Cuenod: Vital staining and biomicroscopy of conjunctiva, 935
Cyclodialysis combined with iridectomy in glaucoma simplex; a preliminary report, 777
Cycloplegia, homatropine, 455
homatropine and atropine cycloplegia, 120
Cyst, acquired cyst of optic disk, *209
free cyst of anterior chamber, 937
multiple pupillary cysts, hereditary and familial, their embryologic significance, 938
sarcoma of iris; report of case complicated by cyst, *864

Dacryocystitis, Dacryocystorhinostomy: See under Lacrimal Organs
Davis, W. T.: Metastatic carcinoma of optic disk with report of case, *226
Deaf-mutes, ideovisual synthesis in education of deaf-mutes, 934
Dejeăn: Formation of vitreous body from basal membranes; its lamellar structure, 939
Multiple pupillary cysts, hereditary and familial; their embryologic significance, 938
DeLong, P.: Sarcoma of choroid; clinicopathologic contribution, 148
Denig, R.: Isolation for iris prolapse, 477
de Takáts, G.: Surgery of orbit, *259
Dextrose content of vitreous in human eye, 910
Diabetes insipidus, traumatic, caused by lesions in region of hypophysis, 135
retinitis in, 912
Diathermy, dosage of transscleral diathermocoagulation with pyrometric electrode, 942
in treatment of ocular diseases, 919
treatment of detachment by perforating diathermocoagulation, 942
Dichlorethylsulfid, lesions caused by poison gas (dichlorethylsulfid), presentation of case, 605
Dioptric power, simple method for calculating, *50
Diplobacillary infection, 600
Diplocoria: See Pupils
Directory of ophthalmologic societies, 150, 314, 482, 630, 790, 952
Dirion, J. K.: Congenital bilateral palsy of abducens, *355
Dott, N. M.: Intracranial resection of optic nerve in retinoblastoma, 626
Draper, G.: Study of human constitution for oculist, 303
Duane, A.: Monocular movements, *530
Dufour, M.: Theory of correcting lenses giving punctal images, 935
Duggan, W. F.: Treatment of toxic amblyopia with vasodilators, 304
Dysostosis: See Bone, growth

Ebert, R. O.: Suture forceps, *576
Echinococcosis of orbit, 3 clinical cases, 945
Ectopia Lentis: See under Lens, Crystalline
Ectropium: See under Eyelids
Eczema, chronic eczema and cataract; report of case, 606
Edema, premonitory edema of lid in typhoid group, 780
Eggston, A. A.: Use of tuberculin in diagnosis and treatment in ophthalmology, *671
Electrolysis in detachment of retina, 772
Elephantiasis of eyelid, *218
Elliot, R. H.: Trephining, *797
Encephalitis, question of localization of "sleep" center (apoplectiform presentation of epidemic encephalitis and ophthalmoplegia interna), 287
Endarteritis obliterans with gangrenous destruction of both eyes, 781
Entropion: See under Eyelids
Epinephrine, effect on intra-ocular pressure and chemical significance, 463
Epitarsus: See Pterygium
Epithelioma of limbus, 294
Ergotamine, effect of subcutaneous injections of ergotamine tartrate (gynergen brand) on tension in glaucoma, 604
Esotropia: See Strabismus
Euphakin, experiences with, 471
Evans, J. N.: Delineation of retinal perivascular region in living human eye, *576
Reflecting prism-lens for slit-lamp microscopy of retina, *274
Scotometry of retinal edema, 785
Exophthalmos, progressive exophthalmos following extirpation of thyroid (association between thyroid and pituitary gland), 608
von Recklinghausen's disease associated with unilateral pulsating exophthalmos, 474
Exudative degeneration of fovea, 2 cases, 475
Eye: See also Accommodation; Foreign Body; Tension; Vision, etc.; and under names of special structures and diseases
absence of; nonoperative method of dilatation of conjunctival sac in anophthalmos, 608
action of E-avitaminosis on eyes of rats, 602
antiquity of forms of transparent ocular media, *837
common laws of experimental ophthalmotonic reactions, direct and consensual, produced by different procedures, 288
cyanosis demonstrating circumcorneal veins, *94
cyst, free, of anterior chamber, 937
determination of linear measures on surface of globe, 124
diagnosis of double perforation of globe by injection of air into space of Tenon, 618

Eye—Continued
dietary deficiency and ocular disease, *580
difference sensitivity (sensible discrimination) of dark adapted periphery of retina, 769
endarteritis obliterans with gangrenous destruction of both eyes, 781
enucleation of eyeball, with reference to use of tonsil snare, 616
Foreign Body in: See Foreign Body
histologic changes in eye 8 years after sclerocautery puncture for separation of retina, *182
immune-biologic reactions on question of hypersensitivity to lens protein in man and animals, 125
infections, lactoprotein injections in, 947
injuries; detachment and sequelae of ocular injuries, 931
lesions caused by stings of bees and wasps; report of cases, 605
method for studying extravisceral eye (experiment on heart-lung-head preparation), 464
movements; congenital absence of lateral movements of one eye, 281
movements; has the eye a center of rotation? 923
movements, monocular, *530
movements; new case of congenital absence of lateral movements of 1 eye (Stilling's syndrome), 281
movements, physiopathology of voluntary and reflex innervation of ocular movements, *738
Muscles: See also Strabismus
muscles; essentials and securities which stabilize operations on ocular muscles, *654
muscles; repair following operations on extraocular muscles; histologic observations, *711
paralysis, cases of, 301
paralysis, congenital bilateral, of lateral movements of, 462
pathway of transportation from one eye to its fellow, *72
pharmacology; interesting experiences in clinical pharmacology, 609
physiology, common laws of experimental ophthalmotonic reactions, direct and consensual, produced by different procedures, 288
physiology, experimental studies of "light tone" of man and rabbit, 610
physiology; vestibulo-ocular reflex paths, 909
plastic anatomy of infants' and children's eyes, 124
pneumococcic infections of eye, 126, 904
zonule in vertebrates, 456

Eyedrops, conservation of, 283

Eyelashes, trichiasis and trachoma among ancient Greeks, 773

Eyelids, anatomy of congenital ectropium uveae (flocculi iridis), 761
elastic tissue of tarsus in generalized argyrosis, 904
elephantiasis of eyelid, *218
Machek operation for ptosis, *495
new operation on lids for facial paralysis, 477
new operation for spastic entropion, 477
operation of choice in trachoma-entropion of upper lid, 935
premonitory edema of lid in typhoid group, 780
self-help in seeing by 4 month old child, 128
sodoku of, 461
symblepharon; late vegetations with symblepharon in vernal catarrh, 935
syphilitic tarsitis, 623

Eyestrain, somaticovisceral functional disorders from eye-stress, *157

Face, hemiatrophy of, with congenital torticollis, refraction in, 290

Fage: Various forms of corneal herpes, 936

Fatigue, visual field of fatigue in melancholia, 614

Ferree, C. E.: Lighting without glare, *31

Fewell, A. G.: Unilateral neuroretinitis of syphilitic origin with stellate figure at macula, 615

Fischer: Studies of subjective visual distance *(Sehferne)* and egocentric estimate of separations, 927

Forceps, combined needle and capsule forceps, *271
suture forceps, *576

Foreign Body, fragment of copper wire in vitreous, 614
rare, case of migration in vitreous, 130

Fovea, disklike massive exudative degeneration of, 2 cases, 475

Fradkine: Three cases of keratitis punctata superficialis; etiology, treatment, 937

Friedenwald, J. S.: Cellular permeability in relation to ophthalmology, *443
Circulation of aqueous; mechanism of reabsorption of fluid, *9
Pathogenesis of retinitis pigmentosa with note on phagocytic activity of Müller's fibers, *173

Friedman, B.: New method of registering graphically ocular pulse, *733

Frisbee, F. C.: Bacteriophage in ophthalmology; a preliminary report, *683

Fritz: Significance of diastolic obliteration of retinal artery, 943

Fuchs, bronze plaques of Professor Fuchs available, 760

Fundus, spectroscopic studies of, 610

Genet: Treatment of detachment by perforating diathermocoagulation, 942

Gifford, S. R.: Biochemistry of lens; permeability of capsule of lens, *414
Machek operation for ptosis, *495

Glasses, contact, new indications for use of, 602
new unbreakable correcting glass, 947
theory of correcting lenses giving punctal images, 935

Glaucoma: See also Tension
chemical composition of blood and spinal fluid in primary glaucoma; comparative studies, *39
contribution to exfoliation of lens capsule or glaucoma capsulo-cuticulare with anatomical preparations, 132
cyclodialysis combined with iridectomy in glaucoma simplex; a preliminary report, 777; correction, 902
daily variation of tension, 130
effect of hypertonic salt solutions injected subconjunctivally in, 129
effect of subcutaneous injections of ergotamine tartrate (gynergen brand) on tension in glaucoma, 604
nevus flammeus of face and globe associated with glaucoma, vascular changes in iris and calcified vascular growth in left occipital lobe of brain with right homonymous hemianopia, *365
primary, and fragility of red cells, 764
primary, and organic constitution, 129
report of case of evisceration performed for hemorrhagic glaucoma with subsequent orbital melanosarcoma, and finally metastasis resulting in death, 779
review of cases of patients with glaucoma admitted to Massachusetts Eye and Ear Infirmary over a period of 2 years, 778
trephining, *797
vertical limbal or oblique extralimbal incision for iridencleisis in glaucoma; efficiency of iridectomies before 1884, *489

Goeckerman, W. H.: Foreign proteins and gold in treatment of uveitis, *250

Goethe's significance in physiologic optics, 922

Gold compounds in ocular leprosy, 776

Goldstein, I.: Retinal vascular disease in case of acute lupus erythematosus disseminatus, *852

Gonin: Detachment and sequelae of ocular injuries, 931

Gonin's Operation: See Retina, detachment

Gonorrhea, relation of conjunctival gonorrhea to genital gonorrhea, 601

Granuloma, palpebral, 2 cases of, 914
telangiectodic, in area of caruncle and tear sac, 2 cases of, 468

Graves, G. O.: Congenital bilateral palsy of abducens, *355

Griscom, J. M.: Corneal dystrophy, 145

Guist: Report on detachment operation with potassium hydroxide, 932

Gundersen, T.: Germicidal effect of ultraviolet rays on virus of herpes, experimental studies, *519

Halpern, L.: Chemical composition of blood and spinal fluid in primary glaucoma; comparative studies, *39

Hambresin: Free cyst of anterior chamber, 937
Unilateral diplocoria with increased intraocular tension, 938

Headaches, ocular, 610

Hemangioma of orbit arising probably from optic nerve sheath, 472

Hematoma of optic nerve sheath, 291

Hemianopia, binasal pathologic observations in, 469
nevus flammeus of face and globe associated with glaucoma, vascular changes in iris and a calcified vascular growth in left occipital lobe of brain with right homonymous hemianopia, *365
softening of calcarine region in case of homonymous hemianopia, 909

Herpes, germicidal effect of ultraviolet rays on virus of herpes, experimental studies, *519
various forms of corneal herpes, 936
zoster ophthalmicus, 788

Heterochromia: See Iris

Heterophoria, classification of heterophoria and heterotropia under standard system of nomenclature, 784

Heterotropia, classification of heterophoria and heterotropia under standard system of nomenclature, 784

High frequency currents, reflections concerning employment of high frequency in ophthalmology, 297

v. Hippel's disease: See under Retinitis

Histamine, cerebral circulation; cerebral blood flow and vasomotor response of minute vessels of human brain to histamine, 137

Holloway, T. B.: Sarcoma of choroid, 618

Holth, S.: Vertical limbal or oblique extralimbal incision for iridencleisis in glaucoma; efficiency of iridectomies before 1884, *489

Homatropine and atropine cycloplegia, 120
cycloplegia, 455

Hormone extract, experiences with a mixed hormone extract (euphakin), 471

Hyaloid Canal: See under Vitreous

Hydatid Disease: See Echinococcosis

Hydrophthalmos: See Buphthalmos

Hypertension: See Blood pressure; Tension

Hypophysis: See Pituitary Body

Hypopyon, traumatic keratitis and transitory hypopyon, 937

Idiocy, mongolian, cataract in, 133

Illumination, lighting without glare, *31
ophthalmologist and lighting problems of his patients, *1

Immunity, phlyctenule as phenomenon of immunity, 282

"Indicia," 754

Infection, focal, abuse of theory of, *24; correction, 268

Instrument: See also Apparatus
combined needle and capsule forceps, *271
device for preventing glare in electric ophthalmoscopes, 765
modified monocular loupe, *272
modified de Wecker's scissors, 765
Schiötz' X-tonometer with convex plunger, 765
suture forceps, *576

Iridectomy, cyclodialysis combined with iridectomy in glaucoma simplex; a preliminary report, 777

Iridectomy—Continued
optical iridectomy should be exceptional operation, 137
soft globe; pupillary seclusion; recovery of normal tonus after iridectomy, 938
Iridencleisis, antiglaucomatous, 764
vertical limbal or oblique extralimbal incision for iridencleisis in glaucoma; efficiency of iridectomies before 1884, *489
Iridocyclitis, anatomic and clinical observations of Koeppe's nodules of pupillary seam in iridocyclitis, 915
Iris anesthesia by retrobulbar injection and paralysis of orbicularis oculi by seventh nerve block, 769
congenital aniridia, 281
family tree of hereditary heterochromia of iris, 296
inclusion operation in eye of rabbit; histologic study, *550
nevus flammeus of face and globe associated with glaucoma, vascular changes in iris and a calcified vascular growth in left occipital lobe of brain, with right homonymous hemianopia, *365
prolapse, isolation for, 477
sarcoma of, report of case complicated by cyst, *864

Jameson, P. C.: Some essentials and securities which stabilize operations on ocular muscles, *654
"Janus Stolp" competition, 454
Jaw, osteomyelitis of superior maxilla in babies, 288
Jeandelize: Retinal tears without appreciable detachment, 941
Johnson, T. H.: Bilateral ophthalmoplegia externa complicating exophthalmic goiter, 473
Hemangioma of orbit arising probably from optic nerve sheath, 472
Jones, E. L.: Somaticovisceral functional disorders from eye-stress, *157
Journal, new Italian ophthalmologic journal, 122
Junes: Operation of choice in trachoma-entropion of upper lid, 935

Kait: Congenital hydrophthalmos; histologic changes, 944
Keratitis, additional experiments verifying presence of Spirochaeta pallida in cornea in experimental interstitial keratitis, 782
micro-organism of Indian superficial punctate keratitis, 601
punctata superficialis, etiology, treatment, 937
traumatic keratitis and transitory hypopyon, 937
tuberculous, experimental and clinical observations on tuberculin reactions in, 127
Keratoconjunctivitis, phlyctenular, in children, 762
Killian, J. A.: Chemical composition of blood and spinal fluid in primary glaucoma; comparative studies, *39
Kirby, D. B.: Pathogenesis of senile cataract, *97
Klien-Moncreiff, B.: Tularemia; some pathologic and clinical manifestations, with report of 2 cases, *245
Atypical pigment line of cornea; biomicroscopic and histologic study, *847
Knapp, A.: Association of sclerosis of cerebral basal vessels with optic atrophy and cupping; report of 10 cases, *637
Subsequent history of retained nucleus after cataract extraction, *441
Koby: Biomicroscopy of vitreous, 940
Koeppe's nodules of pupillary seam in iridocyclitis, 915
Krause, A. C.: Chemistry of lens; composition of albuminoid and alpha crystallin, *166
Krimsky, E.: Modified monocular loupe, *272
Krug, E. F.: Foreign substances injected into vitreous of rabbit; pathway of transportation from one eye to its fellow; experimental study, *72
Venous angioma of retina, optic nerve, chiasm and brain; case report with postmortem observations, *871

Lacrimal Organs, anatomic and embryologic study of lacrimal muscle of Duverney-Horner, 761
anatomy and mechanism of lacrimal sac, 278
both lacrimal sacs lined with stratified pavement epithelium, report of case, 132
case of bloody tears due to commotional disturbance of vegetative nervous system, 131
dacryocystorhinostomy, 623
etiology of hypofunction of lacrimal gland, 285
experiences gathered from 517 dacryocystorhinostomies, cases, 606
grave late complication of dacryocystorhinostomy, 459
latent infection of lacrimal ducts, 284
technic of extirpation of lacrimal sac, 285
telangiectodic granuloma in area of caruncle and tear sac, report of 2 cases, 468
transplantation of lacrimal sac in chronic suppurative dacryocystitis, *831
Lacroix: Optic atrophy consequent on treatment with stovarsol for dementia paralytica, 944
Lacat: Lactoprotein injections in ocular infections, 947
Lactoprotein injections in ocular infections, 947
Lancaster, W. B.: Classification of heterophoria and heterotropia under standard system of nomenclature, 784
Ophthalmologist and lighting problems of his patients, *1
Langdon, H. M.: Intra-ocular sarcoma which filled orbit before medical advice was sought, 618
Lead poisoning, ocular plumbism in children, 299
Lebensohn, J. E.: Biochemistry of lens; permeability of capsule of lens, *414
Lees, D.: Tryparsamide in syphilitic optic atrophy, 623

Lehrfeld, L.: Vernal conjunctivitis, observations on 87 cases at Wills Hospital (1929-1931), *380, 620

Lemoine: Is there a myopic "disease"? 935

Lens, Crystalline; bacterial cultures of emulsions of substance of crystalline lens, 904

bilateral serpiginous ulcer with suppuration of lens and postoperative panophthalmitis, based on constitutional debility, 282

biochemistry; permeability of capsule of lens, *414

chemistry of lens; composition of albuminoid and alpha crystallin, *166

clinical and experimental study of wounds in capsule and posterior layers of lens, 460

contribution to study of exfoliation of lens capsule or glaucoma, capsulo-cuticulare with anatomical preparations, 132

diseases of lens, 908

immune-biologic reactions on question of hypersensitivity to lens protein in man and animals, 125

inorganic constituents of normal and cataractous human crystalline lenses, 286

microphakia, 281

posterior lenticonus, 146, *804

Lenticonus: See Lens

Leprosy, treatment of ocular leprosy with gold compounds, 776

Levine, J.: Acquired cyst of optic disk, *209

Lighting: See Illumination

Lindau's disease: See under Retina

Lindner: Present status of undermining method in detachment, 931

Lipemia retinalis, 771

Lobeck, E.: Retinal detachment and fluid exchange in eye, 930

Loupe, modified monocular loupe, *272

Lourie, O. R.: Abuse of theory of focal infection, *24; correction, 268

Lupus, retinal vascular disease in case of acute lupus erythematosus disseminatus, *852

Lymphogranuloma, annular interstitial infiltration of cornea in malignant lymphogranuloma, 905

McCool, J. L.: Combined needle and capsule forceps, *271

McGuire, H. H.: Gyrate atrophy of choroid and retina (Fuchs), *372

Machek operation for ptosis, *495

McLeod, J.: Wound closure for intracapsular extraction of cataract, *238

MacMillan, J. A.: Transplantation of lacrimal sac in chronic suppurative dacryocystitis, *831

Macula, disklike massive exudative degeneration of fovea, 2 cases, 475

localization and pathology of cortical macula, 925

projection of microscopic specimens illustrating hole in macula, lymph follicles in ciliary body and "posterior vortex veins," 300

Malaria therapy, influence on course of retrobulbar neuritis of syphilitic etiology, 294

Mann, W. A., Jr.: Color photography of fundus oculi, description of new method, *405

Grouped pigmentation of retina, *66

Marin Amat: Melanotic sarcoma starting from pterygium, 936

Marquez: Hydatid cysts of orbit; 3 clinical cases, 945

Marsh, E. J.: Lenticonus posterior; further study, *804

Marx: Sensibility of cornea, 936

May, C. H.: Bronze plaques of Fuchs, 759

Mayer, L. L.: Modern developments in orthoptic training, *888

Meek, R. E.: Sarcoma of iris; report of case complicated by cyst, *864

Meeker, L. H.: Projection of microscopic specimens illustrating hole in macula, lymph follicles in ciliary body and "posterior vortex veins," 300

Megalophthalmus: See under Eye

Meighan, S.: Intracranial resection of optic nerve in retinoblastoma, 626

Melancholia, visual field of fatigue in melancholia, 614

Melano-carcinoma, primary, of ciliary body, 143

Melanosarcoma, report of case of evisceration performed for hemorrhagic glaucoma with subsequent orbital melanosarcoma, and finally metastasis resulting in death, 779

Meningitis, tumor of pituitary body with terminal meningitis, 304

Metabolism, cerebral circulation; respiratory quotient of brain and of extremities in man, 137

relation of basal metabolic rate to progressive axial myopia, 911

Metcalf, M. M.: Eye and ear in "seasickness," *269

de Mets: Ideovisual synthesis in education of deaf-mutes, 934

Meyer, M. F.: Mechanism of accommodation studied experimentally, *53

Microphakia: see Lens, Crystalline

Moore, R. F.: Ocular manifestations of fifth nerve, 787

Mooren's ulcer, 782; correction, 901

Mott, W. C.: Muscle recession with tendon stump and Tenon's capsule fixation, *858

Muscles, Ocular: See Eye, muscle; Strabismus

Myelitis, acute optic neuritis associated with myelitis, 768

Myopia, high myopia in first years of life; report of 17 cases, 465

is there a myopic "disease"? 935

progressive, causation and treatment, 911

qualitative inorganic analyses of sclera in normal human eyes, 459

relation of basal metabolic rate to progressive axial myopia, 911

Nataf: Vital staining and biomicroscopy of conjunctiva, 935

Needle, combined needle and capsule forceps, *271

Nephritis, arteriosclerosis and hypertension, 763

Nerve, Optic, acquired cyst of optic disk, *209

association of sclerosis of cerebral basal vessels with optic atrophy and cupping; report of 10 cases, *637

atrophy consequent on treatment with stovarsol for dementia paralytica, 944

atrophy due to hypophyseal disease, 462

atrophy, treatment by retrobulbar injections of atropine, 612

atrophy, tryparsamide in syphilitic optic atrophy, 623

cancer, metastatic, of optic disk with report of case, *226

choking of optic disks in diseases other than tumor of brain, *821

circulation of aqueous humor; importance of optic nerve, 783

hematoma of sheath, 291

intracranial resection in retinoblastoma, 626

neuromedical observations concerning treatment of tabetic optic atrophy, 298

ocular manifestation of lesions of fifth nerve, 787

transportation of particulate matter from vitreous into, *695

uncommon diseases of optic nerve of orbital, nasal and toxic origin, 945

unilateral neuroretinitis of syphilitic origin, 615

unusual surgical lesions affecting optic nerves and chiasm, 607

venous angioma of retina, optic nerve, chiasm and brain; case report with postmortem observations, *871

Neuritis, acute optic neuritis associated with myelitis, 768

optic, and grip, report of 3 cases, 284

retrobulbar, due to thallium poisoning, 299, 921

retrobulbar, from apiol poisoning, 913

retrobulbar, influence of malaria on course of neuritis of syphilitic etiology, 294

retrobulbar, new clinical sign in diagnosis and prognosis of, 944

Neurofibromatosis; a case of von Recklinghausen's disease associated with unilateral pulsating exophthalmos, 474

Neuroma, plexiform neuroma of orbit, 774

Neuroretinitis, unilateral, of syphilitic origin with stellate figure at macula, 615

Nevus, epibulbar nevo-carcinoma with almost total corneal involvement, 613

flammeus of face and globe associated with glaucoma, vascular changes in iris and calcified vascular growth in left occipital lobe of brain, with right homonymous hemianopia, *365

New York Academy of Medicine, graduate fortnight, 122

Nonidez, J. F.: Transportation of particulate matter from vitreous into optic nerve, *695

Nüssl von Mayendorff, N.: Localization and pathology of cortical macula, 925

Nutrition, dietary deficiency and ocular disease, *580

Nystagmus, concerning coal miner's nystagmus, 768

Obituaries:

Abadie, Charles, 758

Bulson, Albert Eugene, 756

Pagenstecher, Hermann, 903

O'Brien, C. S.: Experimental cataract in vitamin G deficiency, *880

Ophthalmia, bilateral serpiginous ulcer with suppuration of lens and postoperative panophthalmitis, based on constitutional debility, 282

so-called spontaneous panophthalmia, 909

sympathetic, 917, 938

sympathetic, bilateral, cure of, 916

sympathetic, hemotherapy and serotherapy in, 775

sympathetic; pathway of transportation from one eye to its fellow, *72

Ophthalmologic societies, directory of, 150, 314, 482, 630, 790, 952

Ophthalmology, annual midwinter course in ophthalmology and otolaryngology, 900

some French masters of other times, 934

undergraduate teaching of ophthalmology, 900

Ophthalmoplegia externa, bilateral, exophthalmic goiter, 473

question of localization of "sleep" center (apoplectiform presentation of epidemic encephalitis and ophthalmoplegia interna), 287

Ophthalmoscope, device for preventing glare in electric ophthalmoscopes, 765

electric ophthalmoscope, 284

new, handy and inexpensive electrical ophthalmoscope, 131

Ophthalmoscopy, localization ophthalmoscopy, 930

value of globular sedimentation in ophthalmoscopy, 946

Optic Disk: See Nerve, optic

chiasm, venous angioma of retina, optic nerve, chiasm and brain; case report with postmortem observations, *871

Nerve: See Nerve, optic

Optics, Goethe's significance in physiologic optics, 922

Orbit, adenocarcinoma, primary, 915

chloroma of, report of case, 463

cholesteatoma of, 914

evisceration performed for hemorrhagic glaucoma with subsequent orbital melanosarcoma, and finally metastasis resulting in death, 779

hemangioma arising probably from optic nerve sheath, 472

hydatid cysts of, 3 clinical cases, 945

neuroma, plexiform, 774

sarcoma; intra-ocular sarcoma which filled orbit before medical advice was sought, 618

surgery of orbit, *259

Orthoptic training, modern developments in, *888

Osteomyelitis of superior maxilla in babies, 288

Otolaryngology, annual midwinter course in, 900

Panophthalmitis: See Ophthalmia

Papilledema, abscess of brain after lesion of skull and choked disk; report of case, 135

acute choked disk, 611

Paralysis, abducens, congenital bilateral, *355

congenital bilateral paralysis of lateral movements of eyes, 462

divergence, 607

facial, new operation on lids for, 477

general; optic atrophy consequent on treatment with stovarsol for dementia paralytica, 944

normal pupillary reaction in progressive paralysis, 287

Parathyroid cataract, 766

Parker, F. C.: Todd muscle tuck with a modification, *727

Pascal, J. I.: Simple method for calculating dioptric power, *50

Pascheff: Late vegetations with symblepharon in vernal catarrh, 935

Uncommon diseases of optic nerve of orbital, nasal and toxic origin, 945

Paton, R. T.: A local anesthetic in ophthalmology, 777

Paul: Localization ophthalmoscopy, 930

Perkins Institution, centennial, 754

Permeability, cellular, in relation to ophthalmology, *443

Pesme: Case of buphthalmos with pseudoglioma of retina, 943

Peter, L. C.: Enucleation of eyeball, with reference to use of tonsil snare, 616

Pfeiffer, R.: Two cases of disklike massive exudative degeneration of fovea, 475

Pfingst, A. O.: Endarteritis obliterans with gangrenous destruction of both eyes, 781

Phillips, W. H.: Congenital bilateral palsy of abducens, *355

Phlebitis, cured case of phlebitis of facial, angular and superior ophthalmic veins, 283

Phlyctenule as phenomenon of immunity, 282

Photography, chromoretinography, 767

color photography of the fundus oculi, description of new method, *405

Pierce, H. F.: Circulation of aqueous; mechanism of reabsorption of fluid, *9

Operating table for animal experiments, *93

Pigment: See Cornea; Retina

Pituitary Body, ophthalmologic future in cases of tumors in region of hypophysis in which operation has been performed, 134

optic atrophy due to hypophyseal disease, 462

progressive exophthalmos following extirpation of thyroid (association between thyroid and pituitary), 608

traumatic diabetes insipidus caused by lesions in region of, 135

tumor of pituitary body with terminal meningitis, 304

Plague, ocular symptoms of bubonic plague, 603

Pneumococcus in eye, 904

Poison gas, lesions caused by poison gas (dichlorethylsulfid), presentation of case, 605

Polypeptide index and albuminuric retinitis, 913

Posner, A.: Circulation of aqueous humor; importance of optic nerve, 783

Postgraduate study, annual midwinter course in ophthalmology and otolaryngology, 900

summer graduate course in ophthalmology, 123

Poyales: Coats-von Hippel's disease, 942

Pregnancy, hemorrhagic retinitis in vomiting of pregnancy, 772

Presbyopia, investigation of relation between development of presbyopia and duration of life, 912

Pressure: See Tension

Price, N. W.: Homatropine cycloplegia, 455

Prism-lens, reflecting prism-lens for slit-lamp microscopy of retina, *274

Prize, von Graefe, 755

Middlemore, 1933, 754

Proust: Traumatic keratitis and transitory hypopyon, 937

Pseudosclerosis, nature of corneal pigment deposit in, 929

Pseudoxanthoma elasticum and angioid streaks of retina, *334

Pterygium, melanotic sarcoma starting from pterygium, 936

reposition of semilunar fold as an operation for pterygium, 288

Ptosis: See Eyelid

Pulse, a new method of registering graphically ocular pulse, *733

Puntenny, I. S.: Biochemistry of lens; permeability of capsule of lens, *414

Pupils, multiple pupillary cysts, hereditary and familial, 938

unilateral diplocoria with increased intraocular tension, 938

Purpura haemorrhagica of Schönlein-Henoch type, report of case, *649

Radium Therapy: See also under names of various diseases

in New York Eye and Ear Infirmary, 305

Rand, G.: Lighting without glare, *31

Rat-Bite fever, case of sodoku of lids, 461

Raynaud's disease and cataract, 286

Reading, disagreement of two eyes in reading, 770

Recklinghausen's Disease: See Neurofibromatosis

Redway, L. D.: Antiquity of forms of transparent ocular media, *837

Reese, W. S.: Blood-staining of cornea, 147

Posterior lenticonus, 146

Reflex, vestibulo-ocular reflex paths, 909

Refraction curve, human, 610

decrease of refraction produced by injury; report of cases, 771

Imbert's chromoptometry as method for determination of refraction, 771

of cases of congenital torticollis associated with hemiatrophy of face, 290

Refraction—Continued
problem of accommodation and changes of refraction, 291, 465, 466
simple method for calculating dioptric power, *50

Retina, angioid streaks of retina and pseudoxanthoma elasticum, *334
artery; mean tension of central retinal artery, 944
artery; significance of diastolic obliteration, 943
buphthalmos with pseudoglioma of retina, 943
chromoretinography, 767
Coats' disease, retinitis combined with tumor of cerebellum (so-called Lindau or von Hippel's disease) and its relation to Coats' disease, 141
Coats-von Hippel's disease, 942
delineation of retinal perivascular region in living human eye, *576
detachment and fluid exchange in eye, 930
detachment and sequelae of ocular injuries, 931
detachment, electrolysis in, 772
detachment, experiences with ignipuncture, 138
detachment, experimental, 941
detachment, Gonin's operation, 292
detachment; histologic changes in eye 8 years after sclerocautery puncture for separation of retina, *182
detachment, histology of fresh detachments, 940
detachment, newer points of treatment of, 941
detachment, operative treatment of, 933
detachment, origin and treatment of idiopathic and traumatic retinal detachment, 138
detachment, potassium hydroxide sticks in Guist operation for, *92
detachment, present status of undermining method in, 931
detachment, relapses and recurrences of, 467
detachment, report on operation with potassium hydroxide, 932
detachment treated by multiple ignipunctures, 2 cases, 305
detachment, treatment by perforating diathermocoagulation, 942
difference sensitivity (sensible discrimination) of dark adapted periphery of retina, 769
grouped pigmentation of retina, *66
gyrate atrophy of choroid and retina (Fuchs), *372
lipemia retinalis, 771
pathogenesis of pigmentary degeneration of, 611
pathology of "commotio retinae," 773
progressive atrophy of choroid with pigment degeneration of retina, report of cases, 140
reflecting prism-lens for slit-lamp microscopy of retina, *274
reflexes, alterations of, 468
scotometry of retinal edema, 785
spasm of central artery of, 2 cases, 292
tears without appreciable detachment, 941

Retina—Continued
unilateral neuroretinitis of syphilitic origin with stellate figure at macula, 615
vascular disease of, in acute lupus erythematosus disseminatus, *852
venous angioma of retina, optic nerve, chiasm and brain; case report with postmortem observations, *871

Retinitis, albuminuric retinitis and polypeptide index, 913
angiomatosis retinae and retinitis exudativa Coats, 293
combined with tumor of cerebellum (so-called Lindau or von Hippel's disease) and its relation to Coats' disease, 141
diabetic retinitis, 912
hemorrhagic retinitis in vomiting of pregnancy, 772
v. Hippel-Coats' disease, 942
pigmentosa, amyl nitrite treatment after Imre in, 471
pigmentosa, pathogenesis of, with note on phagocytic activity of Müller's fibers, *173
pigmentosa, use of female hormone in, 918
proliferans and multiple aneurysms, 293
punctata albescens, report of 2 cases in which the dots disappeared, *409

Retinoblastoma, intracranial resection of optic nerve in retinoblastoma, 626

Reticulo-endothelial system natural immunity of conjunctiva after blocking reticulo-endothelial system with trypan blue, 600

Rhodes, G. B.: Tularemia; some pathologic and clinical manifestations, with report of 2 cases, *245

Roche: Sympathetic ophthalmia, 938

Roentgen rays, experiments on action of roentgen rays on rabbits' eyes, 458

Rohdenburg, G. L.: Foreign substances injected into vitreous of rabbit; pathway of transportation from one eye to its fellow; experimental study, *72

Rohrschneider: Nature of corneal pigment deposit in pseudosclerosis, 929

Rones, B.: Development of human cornea, *568

Rubbrecht: Newer points of treatment of detachment, 941

Samuels, B.: Venous angioma of retina, optic nerve, chiasm and brain; case report with postmortem observations, *871

Sarcoma, choroid, 618
choroid; clinicopathologic contribution, 148
intra-ocular sarcoma which filled orbit before medical advice was sought, 618
iris; report of case complicated by cyst, *864
melanotic sarcoma starting from pterygium, 936
"smallest" sarcomas of choroid, 915
subchoroidal hemorrhage diagnosed as sarcoma of choroid, report of case, *690

Schlötz' X-tonometer with convex plunger, 765

de Schweinitz, G. E.: An unusual corneal lesions, probably congenital and familial; a slit-lamp study, 783
Sarcoma of choroid; clinicopathologic contribution, 148

Sclera, qualitative inorganic analyses of sclera in normal human eyes, 459

Sclerocautery puncture for retinal separation, histologic changes 8 years after, *182

Sclerosis, association of sclerosis of cerebral basal vessels with optic atrophy and cupping; report of 10 cases, *637

Scotometry of retinal edema, 785

Seasickness, eye and ear in, *269

Sedan: Soft globe; pupillary seclusion; recovery of normal tonus after iridectomy, 938

Silver, elastic tissue of tarsus in generalized argyrosis, 904

Sleep, question of localization of "sleep" center (apoplectiform presentation of epidemic encephalitis and ophthalmoplegia interna), 287

Smith, H.: Statistics of cataract extraction; extracts from official records of India office, *595

Societies, American Academy of Ophthalmology and Otolaryngology, meeting, 454

Congress of Italian Societies for Oto-Neuro-Ophthalmology, and Radio-Neuro-Surgery, 755

foreign, directory of, 150, 314, 482, 630, 790, 952

French Ophthalmological Society, jubilee of French Ophthalmological Society, 598

international, directory of, 150, 314, 482, 630, 790, 952

International Ophthalmological Congress, 123, 901

local, directory of, 153, 317, 485, 633, 793, 955

national, directory of, 150, 314, 482, 630, 790, 952

sectional directory of, 151, 314, 482, 630, 953

state, directory of, 151, 315, 483, 631, 791, 953

Society Transactions:

American Ophthalmological Society, 777

British Medical Association, Section on Ophthalmology, 787

College of Physicians of Philadelphia, Section on Ophthalmology, 145, 615

French Ophthalmological Society, 934

German Ophthalmological Society, 922

New York Academy of Medicine, Section of Ophthalmology, 472

Ophthalmological Society of the United Kingdom, 622

Sodoku: See Rat-Bite fever

Sourdille: Histology of fresh detachment of retina, 940

Spackman, E. W.: Diagnosis of double perforation of globe by injection of air into space of Tenon, 618

Spaeth, E. B.: Iris inclusion operation in eye of rabbit; histologic study, *550

Spectacles: See Glasses

Spectroscope, spectroscopic studies, 610

Spiegel, E. A.: Physiopathology of voluntary and reflex innervation of ocular movements, *738

Spirochaeta pallida; additional experiments verifying presence of Spirochaeta pallida in cornea in experimental interstitial keratitis, 782

Squint: See Strabismus

Stings of bees and wasps, ocular lesions due to, 605

Stough, J. T.: Choking of optic disks in diseases other than tumor of brain, *821

Stovarsol: See Acetarsone

Strabismus, end-results in monocular esotropia, 136

modern developments in orthoptic training, *888

muscle recession with tendon stump and Tenon's capsule fixation, *858

repair following operations on extra-ocular muscles; histologic observations, *711

resection operation for *321

some essentials and securities which stabilize operations on ocular muscles, *654

Todd muscle tuck with a modification, *727

Suture forceps, *576

Symblepharon: See under Eyelids

Synkinesia, ocular, some cases of, 945

Syphilis, can bismuth alone be sufficient in treatment of syphilis of eye? 298

influence of malaria on course of retrobulbar neuritis of syphilitic etiology, 294

production of generalized syphilis in rabbit from ocular lesions, 763

statistical observations on ocular syphilis, 602

tarsitis due to, 623

tryparsamide in syphilitic optic atrophy, 623

unilateral neuroretinitis of syphilitic origin with stellate figure at macula, 615

Table, operating table for animal experiments, *93

Tarsitis: See Eyelids

Tassman, I. S.: Dietary deficiency and ocular disease, *580

Tears, bloody, 131

Teller, I.: Allergic investigations in 23 cases of vernal conjunctivitis, 619

Tenon's capsule, diagnosis of double perforation of globe by injection of air into space of Tenon, 618

Tension, effect of adrenalin on intra-ocular pressure and its chemical significance, 463

importance of intra-ocular tension for healthy and diseased eye, 910

soft globe; pupillary seclusion; recovery of normal tonus after iridectomy, 938

unilateral diplocoria with increased intra-ocular tension, 938

Terry, T. L.: Histologic changes in eye 8 years after sclerocautery puncture for separation of retina, *182

Terson, A.: Some French masters of other times, 934

Thallium poisoning, retrobulbar neuritis due to, 299, 921

Thyroid, progressive exophthalmos following extirpation of, 608

Tonometer, Schiötz' X-tonometer with convex plunger, 765

Tonsil snare in enucleation of eyeball, 616

Torticollis, refraction of cases of congenital torticollis associated with hemiatrophy of face, 290

Town, A. E.: Bacteriophage in ophthalmology; a preliminary report, *683

Trachoma and trichiasis among ancient Greeks, 773

biomicroscopy of trachomatous pannus at its onset, 134

clinical relations between trachoma and tuberculosis, 279

hematology of, 612

intradermal trachomatous reaction of tricoire, based on 511 cases, 773

massage with bismuth oxyiodide gallate in, 913

mechano-vaccinotherapy of trachoma and its complications, 142

operation of choice in trachoma-entropion of upper lid, 935

sensibility of cornea in trachoma, 774

Traquair, H. M.: Dacryocystorhinostomy, 623

Trephining, *797

Trichiasis: See Eyelashes

Tryparsamide in syphilitic optic atrophy, 623

Tschermak-Seysenegg: Goethe's significance in physiologic optics, 922

Tuberculin diagnosis and treatment in ophthalmology, *671

reactions in tuberculous keratitis, 127

Tuberculosis (ocular), 622

and phlyctenular conjunctivitis, 905

biomicroscopy in conjunctival tuberculosis, 457

clinical relations between trachoma and tuberculosis, 279

curative factors and results in, 919

experimental and clinical observations on tuberculin reactions in tuberculous keratitis, 127

in etiology of chronic uveitis and other inflammatory diseases of eyes, 297

management of tuberculous diseases of eyes and their adnexa with roentgen and radium radiations, 144

migratory tubercles; spread of tuberculosis of eye, 764

roentgenotherapy in tuberculous choroiditis, 920

Tularemia, pathologic and clinical manifestations with report of 2 cases, *245

Tumors: See also Cancer; Sarcoma; etc.

influence of tumors on adjacent vessels and its clinical importance, 604

of eyes with particular consideration of therapy, 295

Typhoid, premonitory edema of lid in typhoid group, 780

Tyson, H. H.: Nevus flammeus of face and globe, associated with glaucoma, vascular changes in iris and a calcified vascular growth in left occipital lobe of brain, with right homonymous hemianopia, *365

Ulcer, Mooren's ulcer, 782; correction, 901

Ultraviolet rays, germicidal effect of ultraviolet rays on virus of herpes; experimental studies, *519

Urbanek, J.: Ocular tuberculosis, 622

Uveitis, foreign proteins and gold in, *250

tuberculous etiology of chronic uveitis and other inflammatory diseases of eyes, 297

Vaccines, uses and misuses of, 297

Valois: Is there a myopic "disease"? 935

van der Hoeve: Has the eye a center of rotation? 923

van Lint: From extracapsular to intracapsular extraction, 940

Viallefont: Value of globular sedimentation in ophthalmoscopy, 946

Villard: Multiple pupillary cysts, hereditary and familial; their embryologic significance, 938

Vision, new device for training and testing binocular vision, 774

new international visual acuity chart, 614

studies of subjective visual distance *(Schferne)* and egocentric estimate of separations, 927

visual field of fatigue in melancholia, 614

Vitamins, action of E-avitaminosis on eyes of rats, 602

G deficiency, experimental cataract in, *880

Vitreous, biomicroscopy of, 940

dextrose content of vitreous in human eye, 910

diffusion of hemoglobin in aqueous, vitreous and blood serum, 290

foreign substances injected into vitreous of rabbit; pathway of transportation from one eye to its fellow; experimental study, *72

formation of vitreous body from basal membranes; its lamellar structure, 939

fragment of copper wire in vitreous, 614

hemorrhage and intra-orbital cautery, 775

research on structure of, 927

scintillating opacities of vitreous in anterior chamber, 470

structure and consistency of, 928

transportation of particulate matter from vitreous into optic nerve, *695

Wasps, lesions of eye caused by stings of bees and wasps; report of cases, 605

de Wecker's scissors, modified de Wecker's scissors, 765

Weekers: New clinical sign in diagnosis and prognosis of retrobulbar neuritis, 944

Weve: Experimental retinal detachment, 941

Wexler, D.: Retinal vascular disease in case of acute lupus erythematosus disseminatus, *852

Wheeler, J. M.: von Recklinghausen's disease associated with unilateral pulsating exophthalmos, 474

Whiting, M.: Syphilitic tarsitis, 623

Wilmer, W. H.: A local anesthetic in ophthalmology, 777

Wolfe, O. R.: Wound closure for intracapsular extraction of cataract, *238

Wolff, J.: New operation for spastic entropion, 477

New operation on lids for facial paralysis, 477

New operation for spastic entropion, 477

Wooton, H. W.: Cyclodialysis combined with iridectomy in glaucoma simplex; a preliminary report, 777

Word blindness, traumatic word blindness, 946

Wry-Neck: See Torticollis

Xeroderma pigmentosum, 767

Zentmayer, W.: Bilateral metastatic carcinoma of choroid, 616

Case of bilateral metastatic carcinoma of choroid, 616

Zonule in vertebrates, 456